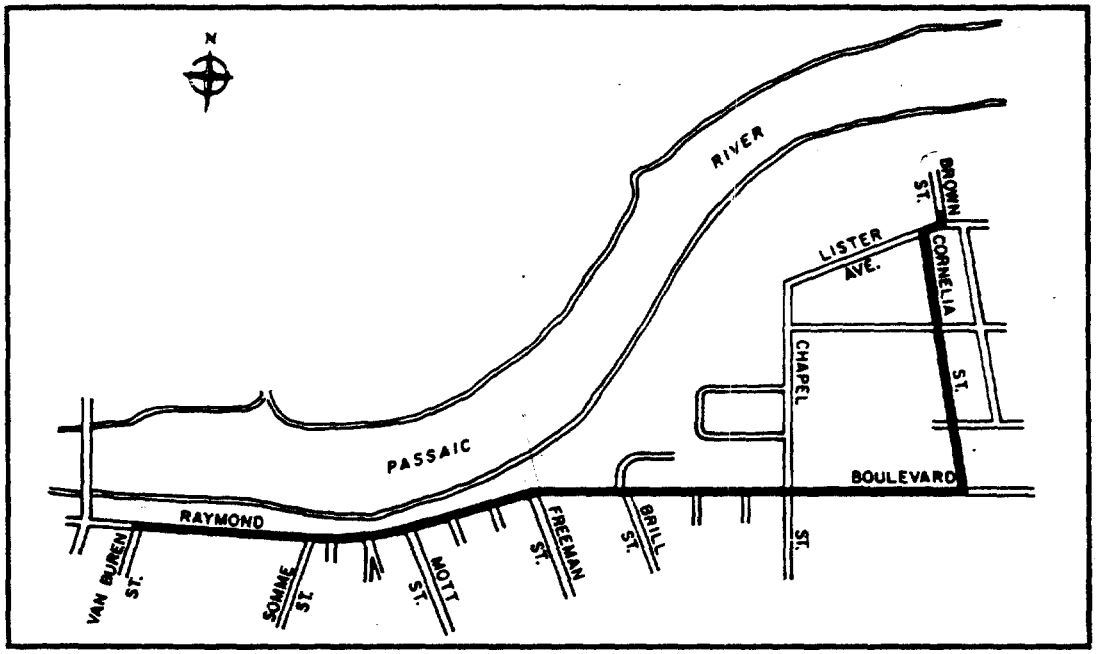
Passaic Valley Sewerage Commissioners
Newark, New Jersey

846570001

BROWN STREET BRANCH INTERCEPTOR EVALUATION



Clinton Bogert Associates
CONSULTING ENGINEERS

July, 1981

KLL010161

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July 20, 1981

Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, New Jersey 07105

Attention: Mr. Carmine Perrapato
Executive Director

Re: Brown Street Branch
Interceptor Evaluation

Gentlemen:

In accordance with the terms of our Contract dated December 3, 1980, we are transmitting herewith the report entitled "Brown Street Branch Interceptor Evaluation".

Conclusions and recommendations indicating the need for the emergency rehabilitation of the 48-inch interceptor segment and further internal inspection of the 24-inch segment may be found on page 18.

Respectfully submitted,

CLINTON BOGERT ASSOCIATES

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ILB/GPJ:pc
Enclosure

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I. INTRODUCTION

The Brown Street Branch Interceptor is located in the eastern portion of the City of Newark, New Jersey as shown on Plate No. 1. It is owned and maintained by the Passaic Valley Sewerage Commissioners (PVSC). There are three distinct segments of the interceptor, a 48-inch diameter concrete-lined tunnel, a 24-inch diameter poured concrete section and a 15-inch vitrified clay pipe. This sewer was placed in service in the 1920's to intercept dry weather flows in the Polk Street, Freeman Street and Brown Street combined sewers. Prior to construction of the interceptor, these combined sewers discharged directly into the Passaic River. The interceptor enables dry weather sewage flows to be transported to the PVSC's Newark Bay Sewage Treatment Plant for eventual discharge in Lower New York Bay.

The alignment of the 48-inch segment is shown on Plate No. 2. It discharges into the Van Buren Street Interceptor through a 36-inch diameter brick section. The interceptor extends approximately 2,450 feet in and along Raymond Boulevard from a regulator chamber at Freeman Street to Van Buren Street. Dry weather flow from the Polk Street combined sewer enters the interceptor at a chamber 275 feet upstream of Van Buren Street. The Freeman Street combined sewer, local combined sewers and the 24-inch segment of the interceptor are connected to the regulator chamber at Freeman Street. The regulator is designed to permit bypassing of excessive wet weather flows in the Freeman Street and local combined sewers. The 24- inch interceptor discharges directly into the 48-inch tunnel and there are no provisions for bypassing its wet weather flow.

Plates No. 3 and 4 show the alignment of the 24-inch and 15-inch interceptor segments. The 24-inch interceptor extends approximately 4,450 feet from the regulator at Freeman Street easterly along Raymond Boulevard, northerly in Cornelia Street and easterly in Lister

Street to Brown Street. The area tributary to the 24-inch interceptor is bounded by Chapel Street, Lister Street, Lockwood Street and Raymond Boulevard. When the interceptor was completed, a regulator was constructed at Brown Street to permit bypassing of excessive wet weather flows. Between the 1930's and the 1970's, several sewer separation projects were completed in the tributary area. The sewers connected to the interceptor are now considered to be separate sanitary lines. The connection to the Brown Street regulator has been plugged and bypassing at that point is no longer possible. The primary sources of flow in the 24-inch interceptor are "wet" chemical industries. Industrial wastes have always been a major component of the flow discharged into the 24-inch sewer. There are also some "dry" industries, commercial establishments, multi-family residences and public housing projects in the tributary area. The 15-inch interceptor was not evaluated during this study. It serves only the Sherwin-William plant complex and was rehabilitated in the early 1970's.

The Brown Street Branch Interceptor has been in service for about 60 years. It has not been altered or extended and remains much as it was constructed in the 1920's. In 1980, the regulators and tide gate chambers at Polk and Freeman Streets were reconstructed but their functions were not changed. The interceptor continues to be an important safeguard to water quality in the lower Passaic River. In the 1970's, the PVSC became concerned about the condition of this sewer. During that time, portions of Raymond Boulevard and the adjacent park, shown on Plate No. 5, began settling. Hazardous conditions were created in the roadway and underground utilities were exposed and undermined. Since these settlements occurred along the alignment of the 48-inch interceptor, the PVSC decided to verify the tunnel's condition by internal inspection. During September and October 1979, a diver was sent in to inspect the sewer between Van Buren and Freeman Streets. The diver reported grooves in the lining along the entire length of the sewer. Several penetrations of the

lining were also found, especially between Van Buren and Polk Streets.

On the basis of the diver's report, the PVSC authorized the preparation of the evaluation of the 48-inch and 24-inch interceptor segments contained herein. This study includes a discussion of internal inspection and physical survey findings, structural and hydraulic analyses, a discussion of rehabilitation/reconstruction alternatives, an environmental evaluation and recommendations for sewer rehabilitation. As this study was being prepared, it became evident that the 48-inch interceptor was in need of immediate rehabilitation. Clinton Bogert Associates informed the PVSC of the interceptor's condition by letter on April 13, 1981. On May 8, 1981, the PVSC authorized Clinton Bogert Associates to proceed with the preparation of detailed plans and specifications for the rehabilitation of the 48-inch interceptor.

II. INTERNAL INSPECTION AND PHYSICAL SURVEY FINDINGS

A. 48-Inch Interceptor

The results of the 1979 diver's inspection were used to evaluate this segment of the interceptor. These results, along with a map and a report by Mr. Edward J. Moller of the PVSC, are included in Appendix "A". The diver noted the extent and depth of concrete erosion, sewage flow depths, infiltration sources and sediment depths. He also measured the sewer's horizontal and vertical cross-section every 25 feet. Since it was unlikely that other means of internal inspection would provide more accurate or detailed information, no further investigations were made in the 48-inch sewer.

It was found that the interceptor had deteriorated to an alarming degree between the Van Buren Street Interceptor and the access chamber at Polk Street. The 36-inch brick transition section at the

downstream end was missing 20 percent of its bricks. The wall of the sewer had been completely eroded at the normal flow line for the first 25 feet, and much of the invert was missing. Holes in the tunnel lining and deep grooves were reported at the flow line for much of the first 275 feet. The holes were between one and seven feet long and varied in height between six and twelve inches. Measurements showed that the cross-section was not circular. The vertical dimension appeared to be elongated and the horizontal dimension appeared to be compressed. These variations in the cross-section were not observed upstream of Polk Street possibly indicating that they may not be the result of poor control during construction. Some of the apparent vertical elongation may be the result of erosion of concrete in the sewer invert.

Erosion of the interceptor was not so severe between the access chamber at Polk Street and the regulator chamber at Freeman Street. Grooves were found in the walls at the flow line along the entire length of the tunnel. These grooves were, in many cases, only one or two inches deep. Occasional holes through the tunnel wall were reported. The map in Appendix "A" shows the location of the holes in the interceptor in relation to surface subsidence areas. It can be readily seen that most holes reported correspond closely to the location of surface settlements. The depths of sediment found downstream of the holes would indicate that significant amounts of soil have entered the tunnel through the holes.

B. 24-Inch Interceptor

The 24-inch interceptor segment was physically inspected during this study. Prior to the inspection, PVSC personnel cleaned the line with bucket machines. The line was first inspected during normal working hours in February 1981. All manholes were located and opened. Tests of the sewer environment revealed oxygen deficiencies and explosive atmospheres throughout the line. A heavy chemical odor

was detected at every manhole. It was noted that the surface of Cornelia Street has apparently subsided between one and two inches along much of the sewer's length. Possible subsidence of up to four inches was observed at the intersection of Euclid Avenue and Cornelia Street.

The interceptor was inspected by entering each manhole and lamping the pipe upstream and downstream. Steel rods were also used to probe the pipe inverts in the immediate vicinity of the manholes. The work was scheduled on Sunday nights when flow depths were found to be lowest. Manholes No. 10-16 were inspected on February 22, 1981 and Manholes No. 1-9 were inspected on March 17, 1981 (see Plates No. 3 and 4 for manhole numbers). The interceptor was found to be in good alignment and no blockages or leaks were observed. Between one-half and three inches of concrete had been eroded from the invert. The extent of erosion was determined by probing and may not be an accurate indication of damage to the line. The depth of sediment and flow in Manhole No. 11 (Euclid Avenue-Cornelia Street intersection) was over six inches greater than sediment and flow depths in the manholes upstream and downstream. Increased sediment and flow depths may be results of a partial blockage downstream of Manhole No. 11. It is also possible that the interceptor has settled.

III. STRUCTURAL ANALYSIS

A. 48-Inch Interceptor

The interceptor was tunneled between Van Buren and Freeman Streets. Contractors were given the options of constructing a 36-inch diameter sewer in an open cut or a 48-inch diameter tunnel. An open cut, between 25 and 35 feet deep, would have been required. This excavation would have been 10 to 15 feet below the level of the Passaic River in porous sand and gravel. The successful contractor chose to construct a tunnel using compressed air. This technique

permitted construction of the interceptor directly under telephone and electrical ducts, as well as other underground utilities that were already located in Passaic Avenue (now Raymond Boulevard).

Construction plans indicate that the tunnel was advanced using a timber exterior liner against which concrete was poured. Nominal concrete wall thickness varied between eight and eleven inches. The concrete was not reinforced. A typical cross-section of the tunnel is shown on Plate No. 6. The tunnel was designed so that soil and water pressures on the exterior of the circular tunnel would create forces directed at the tunnel's geometric center. These forces cause compressive stresses within the tunnel's concrete lining. Since no tensile stresses are created, no reinforcing steel is required theoretically. Secondary factors such as shrinkage, creep and temperature could reduce the compressive stresses somewhat. It does not appear that the present condition of this interceptor is the result of faulty design.

The diver's report clearly indicates that the walls of this sewer have been severely eroded from the inside. Chemical damage in this interceptor was first detected during the 1930's. The industries responsible were fined for dumping acidic wastes. There have always been major chemical industies tributary to the Brown Street Branch Interceptor and the line may have been subject to chemical attack throughout its service life. It is significant, however, that the damage to the interceptor is confined to the area below the spring line. The crown of the tunnel remains intact except at the brick transition into the Van Buren Street Interceptor.

As long as the tunnel crown remains undamaged and supported from below, it should be able to function as an arch to resist vertical forces. In the section of interceptor between the access chamber at Polk Street and the regulator chamber at Freeman Street, there does not appear to be any danger of a structural failure. Downstream of

Polk Street, however, the sewer has been so severely damaged that it is no longer structurally sound. Continued deterioration of the brick transition section could result in a collapse. A sudden failure in this area could create unbalanced earth pressures which could also damage the brickwork in the Van Buren Street Interceptor. The concrete lining between Van Buren and Polk Streets has been penetrated at many points for extended distances. Horizontal force may be forcing portions of the tunnel below the spring line toward the center of the interceptor. The crown of the tunnel may be losing its support below. A situation may be developing such that the unsupported crown must act as a beam along the tunnel's longitudinal axis. The unreinforced concrete in the crown could fail structurally if this occurs.

A structural failure in the 48-inch tunnel would have extremely serious consequences. The collapse of a section of Raymond Boulevard could cause vehicular accidents, damaging vehicles and injuring their occupants. An extended closing of the roadway might be necessary to complete repairs. Damage to underground utilities immediately above and adjacent to the tunnel could be severe. A ruptured high pressure gas main could cause a very dangerous situation with the potential for an explosion. Several other utilities could be undermined by leakage from a ruptured high pressure water main. The main electrical distribution line from PSE&G's Essex generating facility and telephone transmission lines linking New York City with the southeast United States could be severed. This would result in far reaching service interruptions. And, a collapse could completely block the interceptor, causing six million gallons of toxic industrial waste to be bypassed into the Passaic River daily. Even if a dramatic failure did not occur, continued washing of soil into the tunnel through holes will create hazardous conditions in Raymond Boulevard and threaten the integrity of utilities therein.

B. 24-Inch Interceptor

The 24-inch diameter interceptor was constructed using the open cut method. The conduit was formed and poured continuously. As with the tunnel section downstream, the concrete was unreinforced. A typical cross-section is shown on Plate No. 7. A thicker section was used between Raymond Boulevard and Euclid Avenue where the sewer passed under the former Morris Canal and a railroad yard. Based on the physical survey results it does not appear that this sewer is in danger of collapse. Concrete erosion appears to be limited to the invert of this interceptor. The line may have settled in the Euclid Avenue-Cornelia Street intersection. This settlement may have caused some transverse cracking but it does not appear to be cause for immediate concern. Holes in this sewer do not have a high potential for disrupting major utilities or causing settlement in Raymond Boulevard.

IV. HYDRAULIC ANALYSIS

A. 48-Inch Interceptor

Sewage flow information from the PVSC's Infiltration/Inflow Analysis (1976) was used in the hydraulic evaluation of the interceptor. The hydraulic analysis was made to determine hydraulic limitations for rehabilitation options, to establish criteria for temporary pumping facilities and to permit sizing of a replacement sewer. The following average daily dry weather sewage flows, including infiltration/inflow (I/I), were used.

24-inch Interceptor	2.5 mgd
Freeman Street combined sewer	1.2 mgd
Polk Street combined sewer	2.3 mgd

Ratios of peak flow rates to average daily base flows in these sewers varied between 1.9 and 2.5 during the I/I Analysis. No flow

data was obtained in the 48-inch interceptor. For purposes of this evaluation, it was conservatively assumed that peaking factors in the interceptor vary between 2 and 2.5 times average daily flow. Peak flow rates in the interceptor were estimated to vary between 7.4 and 9.3 mgd downstream of Freeman Street and between 12 and 15 mgd downstream of the Polk Street connection. When new, it is estimated that the 48-inch interceptor had a capacity of 25 mgd. At the same gradient, a new 42-inch sewer would have a capacity of 17.5 mgd, and a new 36-inch sewer would have a capacity of 11.5 mgd. Based on this analysis, it appears that a 42-inch diameter sewer is the minimum size required to pass peak flows without surcharging and to allow capacity for future flow increases. The criteria for designing temporary pumping facilities, assuming a 2.5 peaking factor, is as follows:

	Avg. Daily Flow	Peak Flow Rate
Freeman Street regulator chamber	3.7 mgd	9.3 mgd
Polk Street regulator chamber	2.3 mgd	5.8 mgd

B. 24-Inch Interceptor

Recent flow data was not available for the 24-inch interceptor or its tributary area. An average daily sewage flow rate of 2.5 mgd (including I/I) was cited in the PVSC's I/I Analysis. During the sewer system evaluation survey, only a portion of the tributary area was monitored and no flow measurements were obtained in the interceptor. The available flow data was not considered adequate for this study so additional measurements were obtained. An electronic flow meter was installed at Manhole No. 5 (see Plate No. 3). Since experiments indicated that the sewage would attack the fiberglass used in flumes, depth to flow rate relationships were established by measuring sewage velocities with an electronic velocity meter.

It was found that daily sewage flows averaged 0.9 mgd in dry weather. Weekday flows averaged 1.0 mgd and weekend flows averaged 0.7 mgd. Weekday flow rates varied between 0.7 and 1.4 mgd, and weekend flow rates remained stable at 0.7 mgd. The most recent water billing records and industrial wastewater data were used to compute a base sewage flow of 0.8 mgd. A comparison of the 0.8 mgd base flow with the actual recorded flow of 0.9 mgd indicates that there is not a serious dry weather I/I problem in the interceptor or its tributary area. It should be noted, however, that flow was monitored during an extended period of dry and cold weather. Infiltration rates may be substantially higher during periods with normal rainfall conditions. The interceptor appears to have sufficient hydraulic capacity for present dry weather flow rates. Peak daily flow rates do not exceed 1.4 mgd, while the capacity of the line, in good condition, is estimated to be 4.6 mgd. Even with sedimentation and concrete deterioration, peak daily flows monitored were never deeper than ten inches in dry weather.

Flow monitoring data obtained during rainfall events indicates that there are inflow sources in the tributary area. Flow rates increased very rapidly during rainstorms and returned to slightly above normal within a few hours of the storm's end. On February 20, 1981, over 1.5 inches of rain fell. Sewage flow rates doubled in a single hour and remained between 3.0 and 4.0 mgd for three hours before subsiding to dry weather levels. The sewers tributary to the interceptor are supposed to be separate sanitary lines. It is known, however, that there are inflow sources in the tributary area. In the January 1979 report, entitled "City of Newark Pollution Abatement Program," roof drain, area drain and storm inlet connections were identified in the tributary area. There may be additional improper connections in sewers not investigated during that study. Investigation of inflow sources in the tributary sewers was beyond the scope of this study. Further evaluation is required to isolate and eliminate direct inflow connections. The 24-inch interceptor was not

sized to accept stormwater. Storm drains are available in the tributary area and inflow sources should be reconnected to these sewers.

The condition of the 24-inch interceptor could not be fully determined during the physical inspection. Flow depths were never lower than six inches and the pipe inverts could not be seen. Concrete erosion is suspected below the normal flow level but can only be verified by internally inspecting the line without any flow in it. Since industries discharge day and night, seven days a week, plugging and/or bypass pumping would be required to permit inspection of the line. The possibility of avoiding the high cost of bypass pumping by plugging the interceptor and using the storage capacity of tributary sewers was investigated. It was assumed that the television inspection would be done on weekends or at night when flow rates are lowest. A flow rate of 0.8 mgd was used in the computations. The maximum surcharge level was set at four feet in the first manhole upstream of the plug. Using these standards, the installation of plugs would result in maximum surcharge levels being reached in the times indicated below.

Plug Location (Manhole Number)	Allowable Time (in Minutes)
13	75
12	100
11	110
10	150
9	85
8	100
7	100
6	110
5	120
4	125
3	135
2	150

The computations indicate that sufficient time is available to inspect the interceptor downstream of Manhole No. 13 without the use of bypass pumping. Allowable times are not shown for plugs upstream of Manhole No. 13 because very little storage is available in those sewers. An inspection of the interceptor downstream of Manhole No. 13 would give a good indication of the sewer's condition. No roadway subsidence or other evidence of the interceptor's deterioration has been observed upstream of that manhole. If it was felt that inspecting the three upstream lengths was necessary, bypass pumping would be required. Special ventilating and personal safety equipment would be required to protect those performing the plugging and inspection work from the toxic sewage and hazardous atmosphere.

V. REPLACEMENT AND REHABILITATION ALTERNATIVES

A. 48-Inch Interceptor

1. Construction of Parallel Replacement Interceptor

A parallel 42-inch diameter interceptor could be constructed while the existing 48-inch tunnel remained in service. The 48-inch interceptor would be grouted and filled with sand when the new sewer was placed in service. Vitrified clay pipe would be used to provide maximum chemical resistance and concrete encasement would be required to obtain the necessary structural strength. The existing regulator chambers at Polk and Freeman Streets could be connected to the new line with minor modifications. By constructing the new sewer in the park north of Raymond Boulevard, conflicts with traffic and utilities would be minimized. The downstream connection to the Van Buren Street Interceptor could be tunneled under Raymond Boulevard without interference with traffic. The remaining construction would be done in an open cut, using tight sheeting and dewatering. Areas that have subsided would be filled and utilities would be braced. The alignment of this proposed sewer is shown on Plate No. 8. The proposed

vitrified clay interceptor could provide indefinite trouble-free service even if subjected to highly concentrated chemical waste. The sewer could be constructed without bypass pumping and with minimum interference with traffic and utilities. There might be extensive delays in receiving materials however, since 42-inch vitrified clay pipe is not normally stocked by suppliers. These delays could extend the project's duration to 18 months. And, construction of this type is likely to have a negative short-term environmental impact greater than alternative rehabilitation techniques.

The cost of constructing a new interceptor was estimated as follows:

Item	Cost
42" V.C. Pipe - 2350 ft	$4,400,000
42" V.C. Pipe in Tunnel - 100 ft	500,000
Manholes - Five (5)	50,000
Modify Existing Chambers	50,000
Grout Voids	90,000
Fill 48" Tunnel with Sand	65,000
Roadway and Utility Repairs	145,000
Subtotal	$5,300,000
Contingency (10%)	530,000
Total Construction Cost	$5,830,000

In addition to the construction cost of $5,830,000, the following costs would be incurred:

Item	Cost
Engineering	$ 368,000
Legal, Fiscal and Administrative	$ 292,000
Construction Inspection	$ 205,000

2. Rehabilitation by Shotcreting

The lining of the existing tunnel could be restored and reinforced using shotcrete. In this method, the interceptor would be taken out of service by installing temporary bypass pumping facilities at Polk and Freeman Streets. Three additional access chambers would be constructed to facilitate rehabilitation operations and future maintenance of the line. The locations of the proposed access chambers and bypass pumping facilities are shown on Plate No. 9. After the interceptor was taken out of service, sediment would be removed and the interior would be washed and sandblasted. All loose or deteriorated concrete would be removed. Holes in the lining would be grouted and additional grout would be injected into voids in the soil outside the tunnel. Steel mesh would then be attached to the interior of the interceptor and sprayed with concrete. The existing tunnel lining would be restored and an additional three inches of concrete would be added. This additional concrete would not reduce the tunnel's diameter to less than 42 inches. In the structurally unsound portion of the interceptor between Van Buren and Polk Streets, steel mesh and concrete would be placed around the entire inner circumference of the tunnel. Upstream of Polk Street, concrete and mesh would be placed only below the spring line. The proposed restored cross-sections are shown on Plate No. 10. Test pits would be dug at the surface in known areas of subsidence or above holes found in the tunnel lining. Utilities would be located and borings obtained. Grout, select fill and bracing would be placed as required to prevent further settlement of the roadway and the utilities therein.

The primary disadvantage of shotcreting is low resistance to chemical attack. A special chemically-resistant concrete mix and a densifying additive could be specified. This type of concrete would limit chemical penetration and damage. Epoxy coatings would not be

an effective protection since chemicals in the sewage could dissolve the epoxy. Lining the sewer with vitrified clay plates would provide excellent chemical protection. Installing such a liner would be prohibitively expensive however, and the reliability of the mortar used to hold the plates would be questionable. If the proper concrete mix was used, the shotcrete lining could resist occasional spills or deliberate dumping of concentrated chemicals. Enforcement of industrial pre-discharge standards will be required to prevent erosion of the shotcrete lining through continuous contact with concentrated chemical wastes.

Restoration of the line by shotcreting could be completed in six months. Construction costs were estimated as follows:

Item	Cost
Mobilization/Demobilization	$ 50,000
Temporary Bypass Pumping	500,000
Access Chambers - Three (3)	450,000
Lighting/Ventilating	250,000
Internal Cleaning	80,000
Shotcreting - Full Section - 275 ft	110,000
Shotcreting - Half Section - 2175 ft	325,000
Grouting Voids	90,000
Roadway and Utility Repairs	145,000
Subtotal	$2,000,000
Contingency (10%)	200,000
Total Construction Cost	$2,200,000

In addition to the construction cost of $2,200,000, the following costs would be incurred:

Item	Cost
Engineering	$ 87,000
Legal, Fiscal and Administrative	110,000
Construction Inspection	155,000
	$ 352,000

Total project costs are estimated at $2,552,000.

3. Insertion of Liners

Insertion of plastic piping or other types of liners into the 48-inch sewer would not be an effective method of repair. A plastic liner could be placed inside the tunnel using slip-lining techniques. Several access ramps, 30 feet deep and 75 feet long, would be required to pull the pipe into the interceptor. However, plastic pipe could be attacked by chemicals in the line. This would be especially true if a concentrated spill occurred. Many of the chemicals used at tributary industries could seriously damage a plastic pipe in a matter of hours. The size of the tunnel precludes the use of other types of piping for insertion. The largest concrete pipe that could be placed inside the interceptor would be 36 inches in internal diameter. Hydraulically, this size would not be adequate. It would be virtually impossible to insert such a pipe into a 48-inch opening and then grout the annular spaces. And, a concrete pipe could deteriorate in the same manner as the tunnel's concrete lining.

B. 24-Inch Interceptor

The condition of the 24-inch interceptor is only partially known. The extent of concrete erosion below the flow line has not been determined. Based on the condition of the 48-inch interceptor downstream, extensive damage is probable. The possible settlement of

the roadway surface, and possibly the interceptor at the Cornelia Street-Euclid Avenue intersection also suggests significant deterioration of the line. It will be necessary to inspect the sewer with closed-circuit television equipment to define the interceptor's condition. And, there are limited options for repairing damage that is found.

Sliplining is not feasible because the chemical waste would attack the plastic liner pipe. (Large quantities of chemicals that could attack plastic piping are stored in the tributary area.) Even if predischarge standards were enforced, accidental spills or deliberate dumping of certain chemicals could damage the liner in a matter of hours. Sewer grouting procedures are effective in sealing leaking joints or transverse cracks. These techniques could not be used to repair extensive longitudinal erosion and penetration of the interceptor walls. Methods used to restore the linings of water mains require a structurally sound pipe and a circular cross-section. Neither condition is likely to be found when the 24-inch interceptor is cleaned and inspected. Restoration of the sewer by shotcreting is not possible because of the small diameter. The only remaining alternatives are localized repairs and replacement.

In the worst case, it would be necessary to replace the entire 4450 feet of interceptor with a parallel 24-inch line as shown on Plates No. 11 and 12. The old interceptor would be taken out of service and filled with sand. The replacement pipe would be vitrified clay to provide maximum chemical resistance. It could be constructed along the north side of Raymond Boulevard to minimize traffic interference and conflicts with other utilities. It may be found that only a portion of the existing sewer will require paralleling. Localized problems, such as holes, cracks and misalignments, could then be exposed by excavation and repaired. The work required can not be defined until internal inspection is complete. It is estimated that it will cost about $8,000 to inspect the interceptor from Manhole No. 13 to the Freeman Street regulator chamber.

C. Environmental Evaluations

The environmental assessment of rehabilitation alternatives discussed herein was submitted in advance of this report. This was done to expedite the funding of emergency repairs proposed for the 48-inch interceptor. The environmental assessment submitted is included in Appendix B.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. 48-Inch Interceptor

1. Industrial chemicals in the sewage have eroded the concrete lining of the 48-inch tunnel along its entire length. Structural integrity has been lost between the Van Buren Street Interceptor and the Polk Street access chamber. The probability of a collapse in that section is rapidly increasing.

2. Voids are being created outside the tunnel as soil, carried by groundwater, enters the line through holes in the lining. These voids are filled by the settlement of soil above them, causing subsidence of the ground surface.

3. The consequences of a collapse of the interceptor or continued surface subsidence could be very serious. Hazardous conditions could be created on Raymond Boulevard forcing indefinite closing of the roadway. Major electrical, telephone, gas and water lines could be severed. A collapse could block the interceptor causing sewage to be bypassed and could also damage the Van Buren Street Interceptor.

4. It is recommended that the interceptor be rehabilitated by shotcreting as shown on Plate No. 10. Temporary pumping

facilities would be provided to divert flow around the interceptor during construction. Three additional access chambers would be constructed to facilitate the repair work and future maintenance operations. Undermined roadway surfaces and utilities would be repaired and braced. The interceptor could be repaired within six months of contract award if this method is used. The total project cost for this work was estimated as follows:

Item	Cost
Construction Cost	$2,200,000
Engineering	87,000
Legal, Fiscal and Administrative	110,000
Construction Inspection	155,000
Total Project Cost	$2,552,000

5. On April 13, 1981, Clinton Bogert Associates reported the condition of the interceptor to the PVSC and recommended immediate rehabilitation. The PVSC authorized preparation of detailed plans and specification on May 8, 1981. Copies of these letters may be found in Appendix C. It is presently planned to advertise the rehabilitation contract in July and award it in August, 1981.

B. 24-Inch Interceptor

1. The condition of the 24-inch interceptor is not well defined. There does not appear to be any immediate danger of the line collapsing or of subsidence damaging major utilities. Significant concrete erosion is anticipated, however, based on the condition of the 48-inch interceptor. The entire sewer between Manhole No. 13 and the regulator at Freeman Street should be inspected with closed-circuit television equipment to determine its condition. This inspection would cost approximately $8,000, and could be completed during low flow periods without bypass pumping. The inspection cost

could be increased if additional sediment buildup makes heavy cleaning necessary.

2. Television inspection results will determine the extent of work required in the interceptor. Localized damage could be excavated and repaired. More extensive damage or settlement could only be corrected by constructing a parallel replacement interceptor. Costs for partial replacement or localized repairs can only be estimated after the internal inspection. The total project cost of replacing the entire 4450 feet of 24-inch interceptor was estimated as follows:

Item	Cost
Construction Cost	$2,200,000
Engineering	152,000
Legal, Fiscal and Administrative	110,000
Construction Inspection	205,000
Total Project Cost	$2,667,000

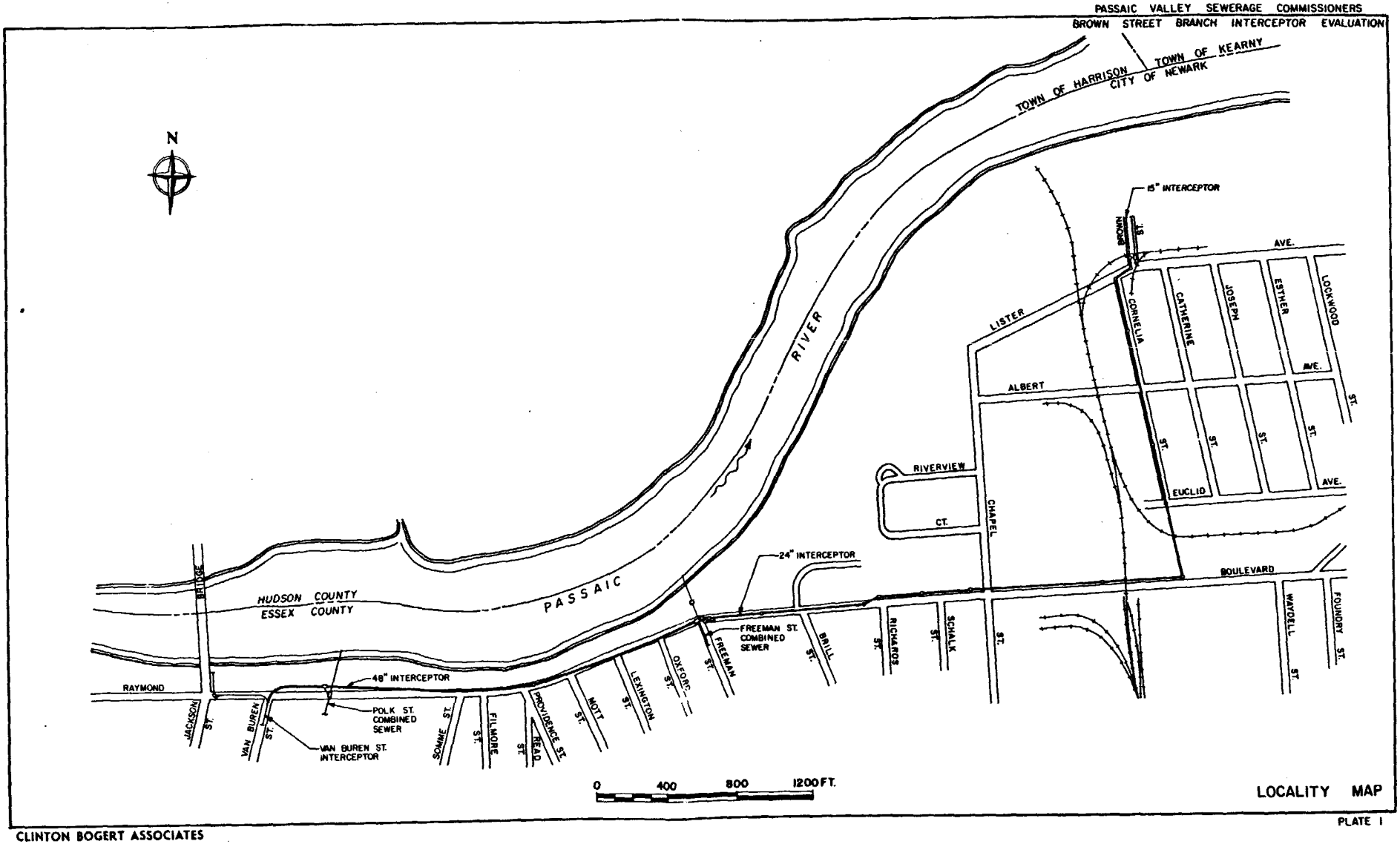
C. General Recommendations

1. The Brown Street Branch Interceptor has been severely damaged by industrial wastes. Industrial predischarge standards should be enforced at the tributary industries to protect the Commissioners' investment in their interceptor system. If these standards are not enforced, it may be necessary to rehabilitate the 48-inch interceptor again in 10 to 20 years.

2. Sewers tributary to the 24-inch interceptor should be evaluated for inflow sources. All direct inflow sources should be eliminated to prevent surcharging of the line and to reduce wet weather peak flows in the interceptor system downstream.

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



LOCALITY MAP

PLATE I

CLINTON BOGERT ASSOCIATES

KLL010185

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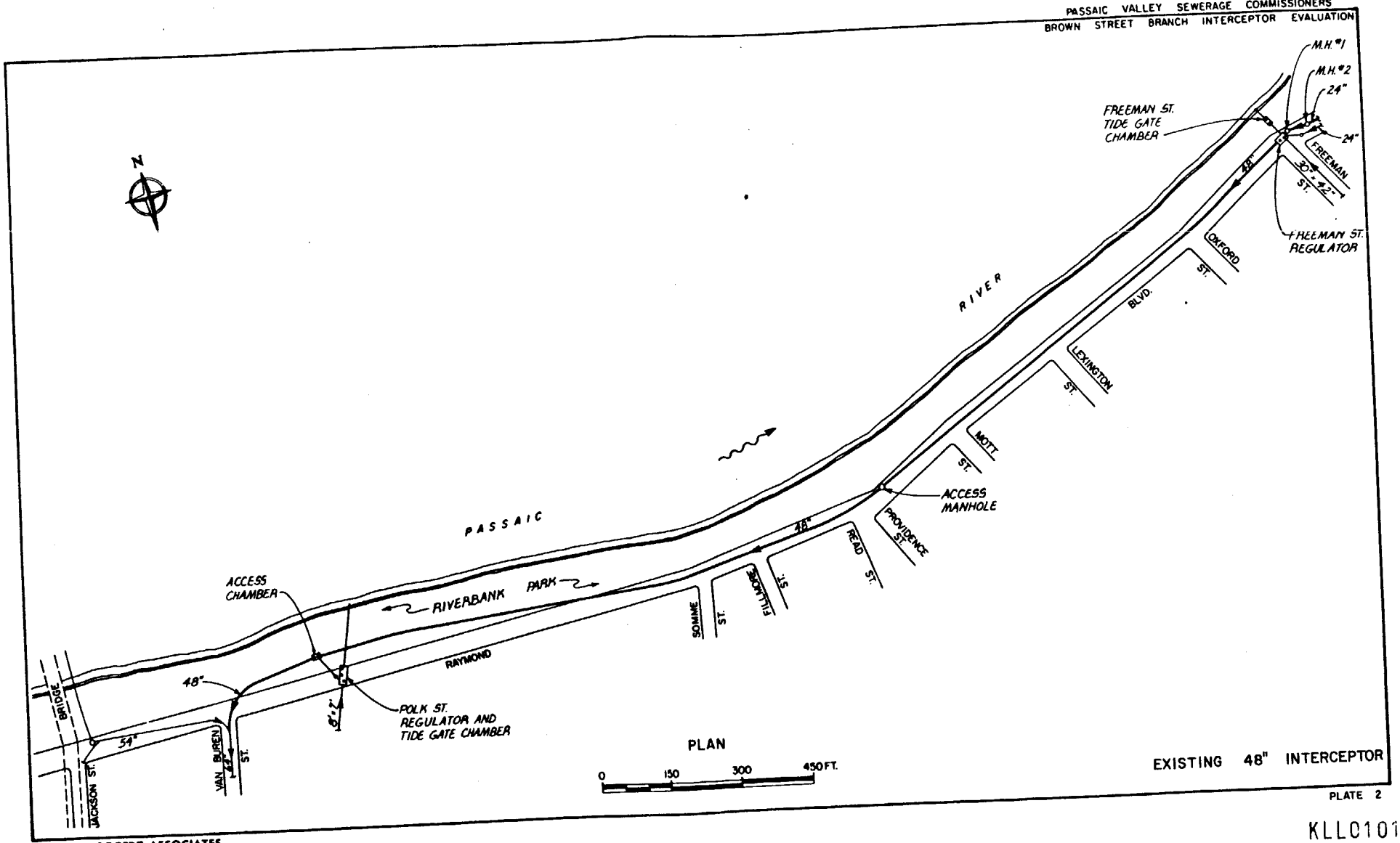
PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



EXISTING 48" INTERCEPTOR

PLATE 2

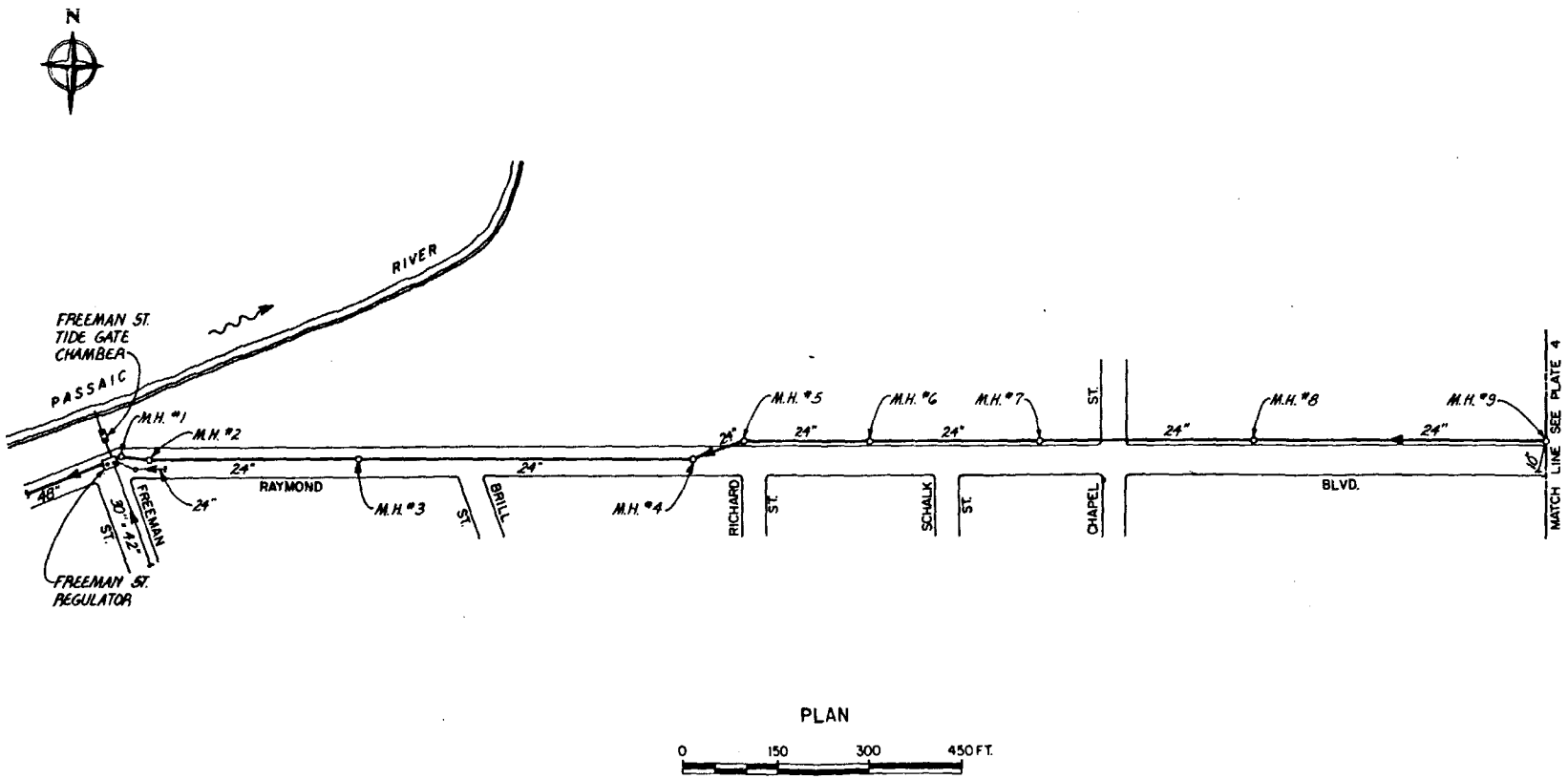
CLINTON BOGERT ASSOCIATES

KLL010186

846570026

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



EXISTING 24" INTERCEPTOR

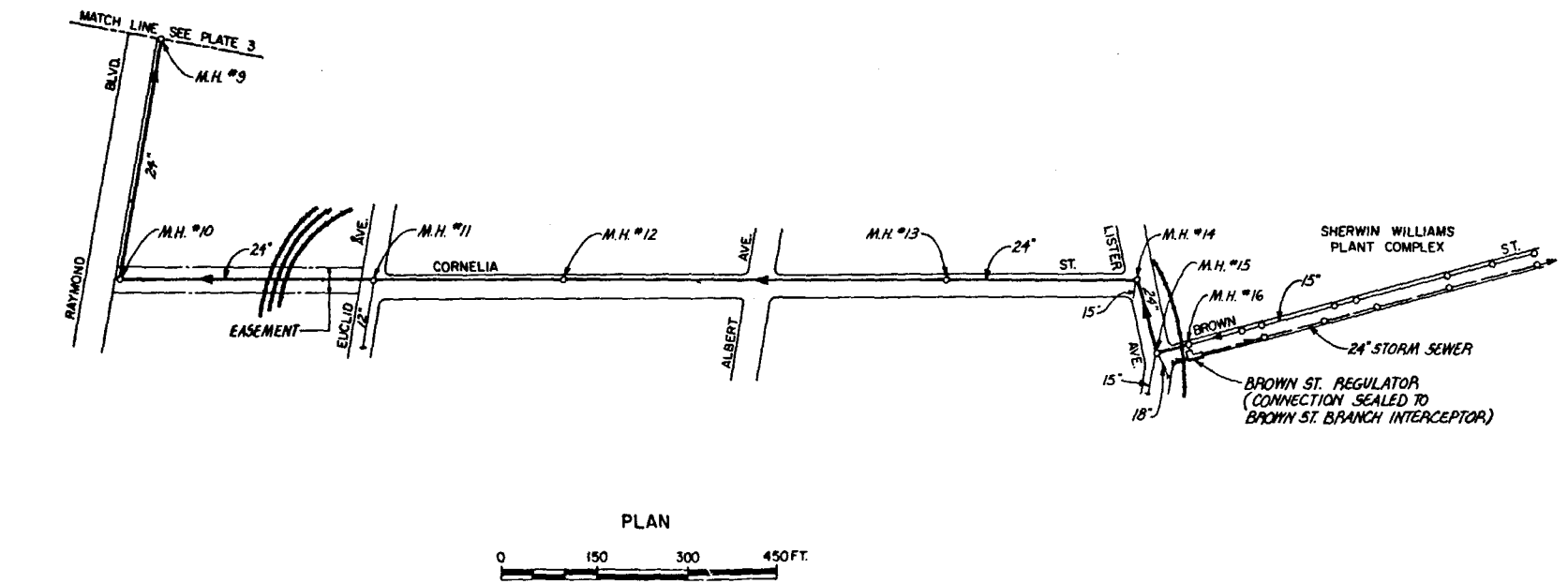
CLINTON BOGERT ASSOCIATES

PLATE 3

846570027

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



PLAN

0 150 300 450FT.

EXISTING 24" INTERCEPTOR

CLINTON BOGERT ASSOCIATES

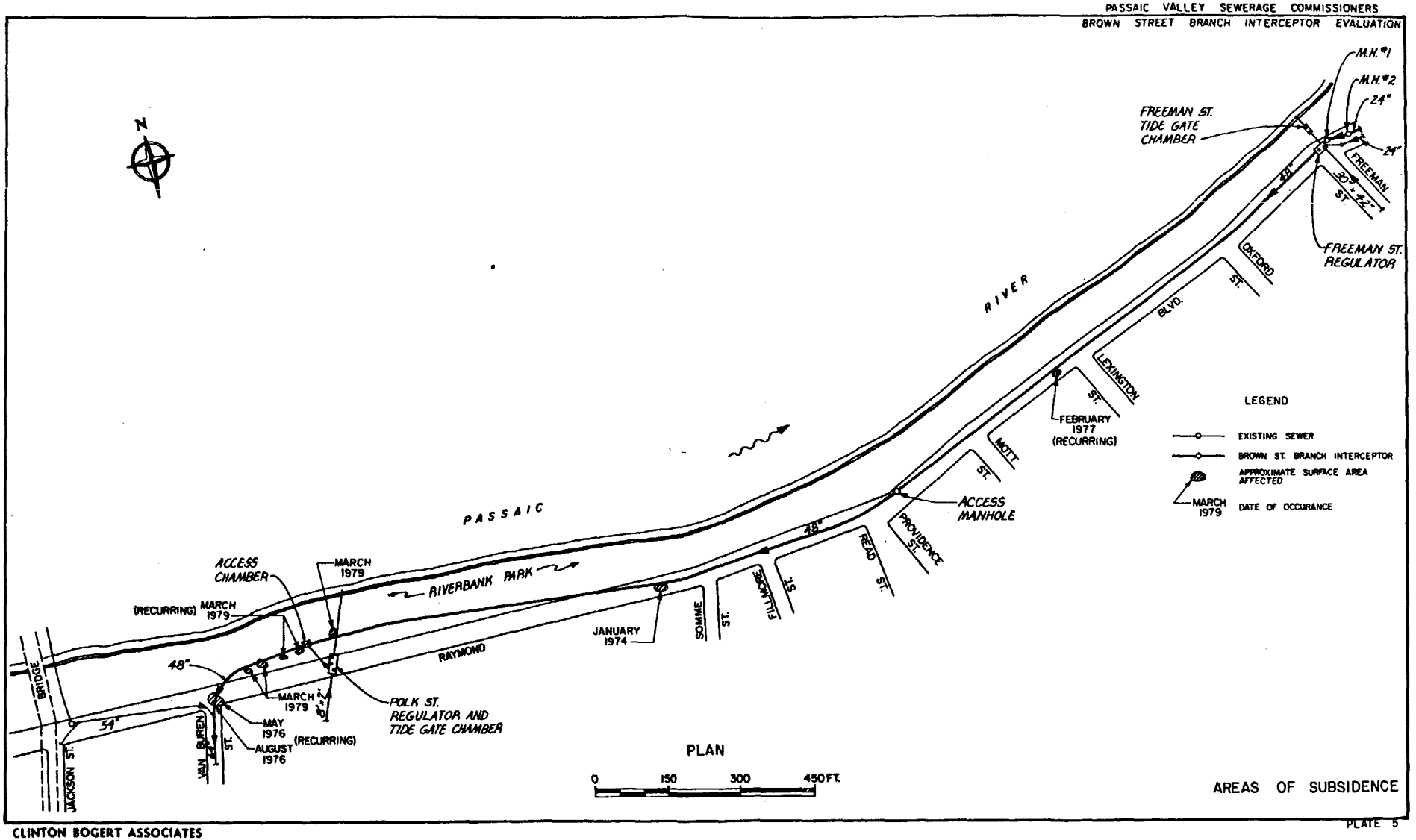
PLATE 4

KLLC10188

846570028

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION

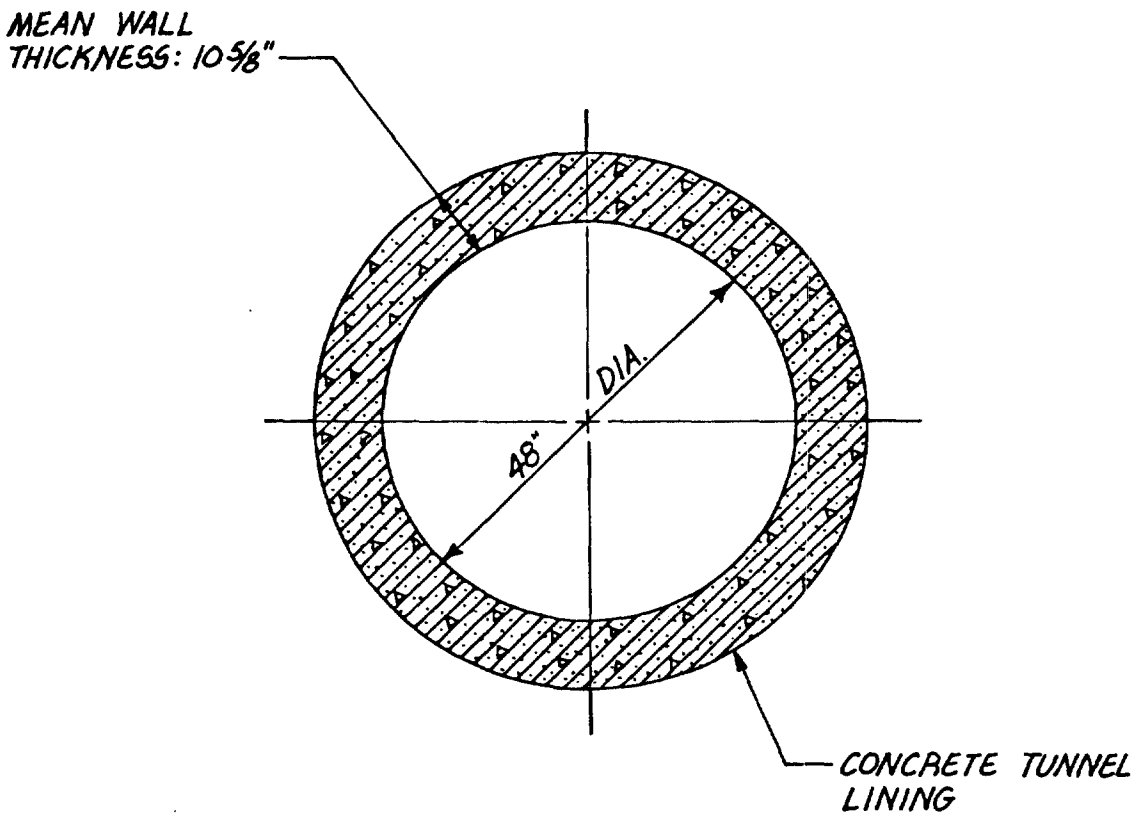


CLINTON BOGERT ASSOCIATES

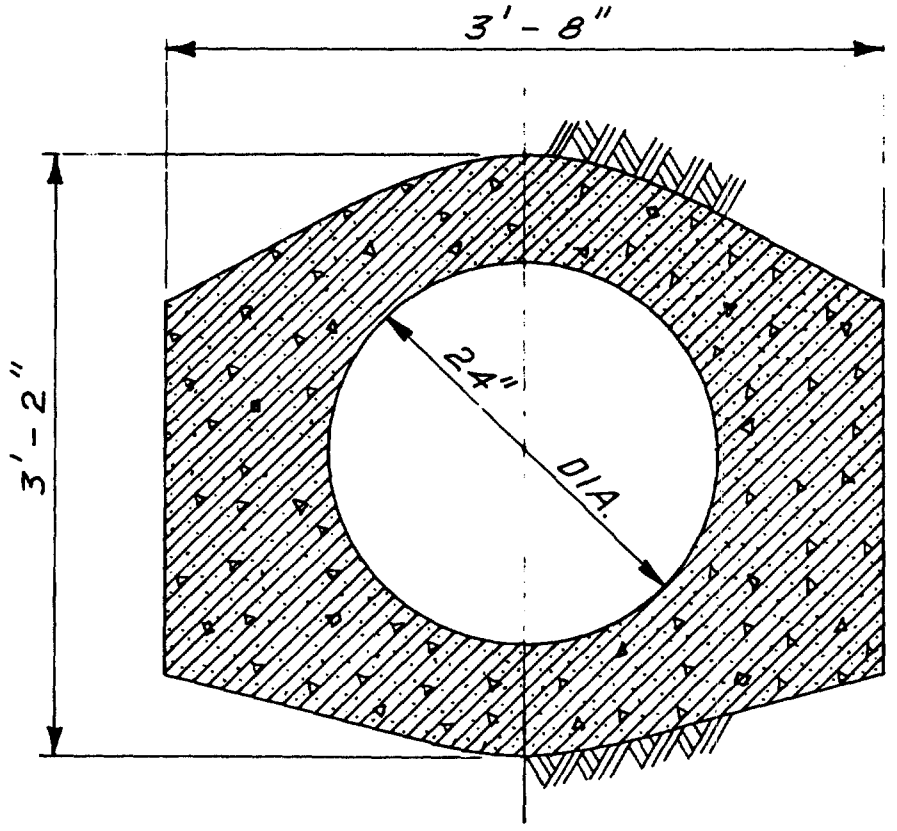
PLATE 5

KLLC10189

846570029



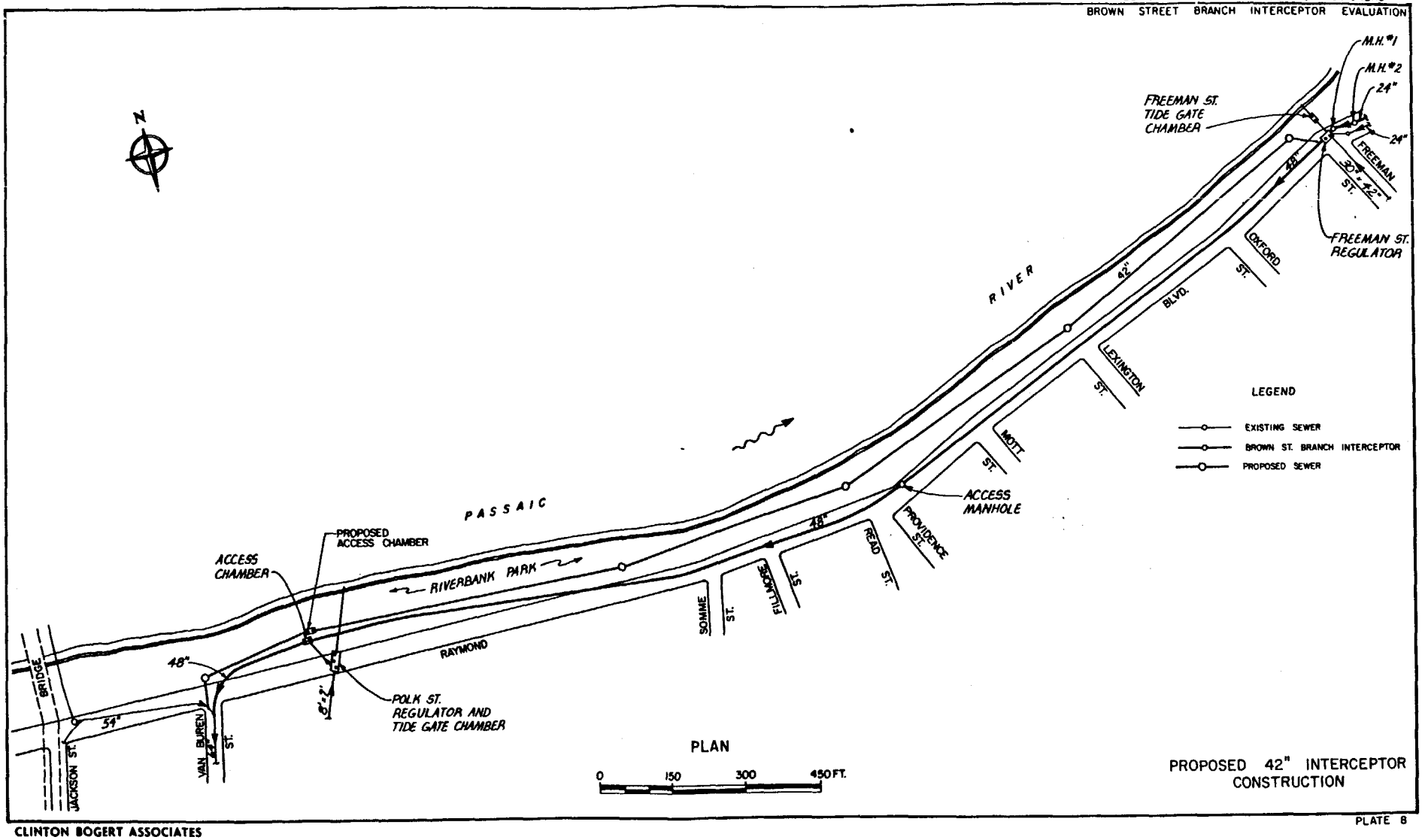
TYPICAL CROSS SECTION
48" INTERCEPTOR



TYPICAL CROSS SECTION
24" INTERCEPTOR

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



CLINTON BOGERT ASSOCIATES

PLATE 8

KLL010192

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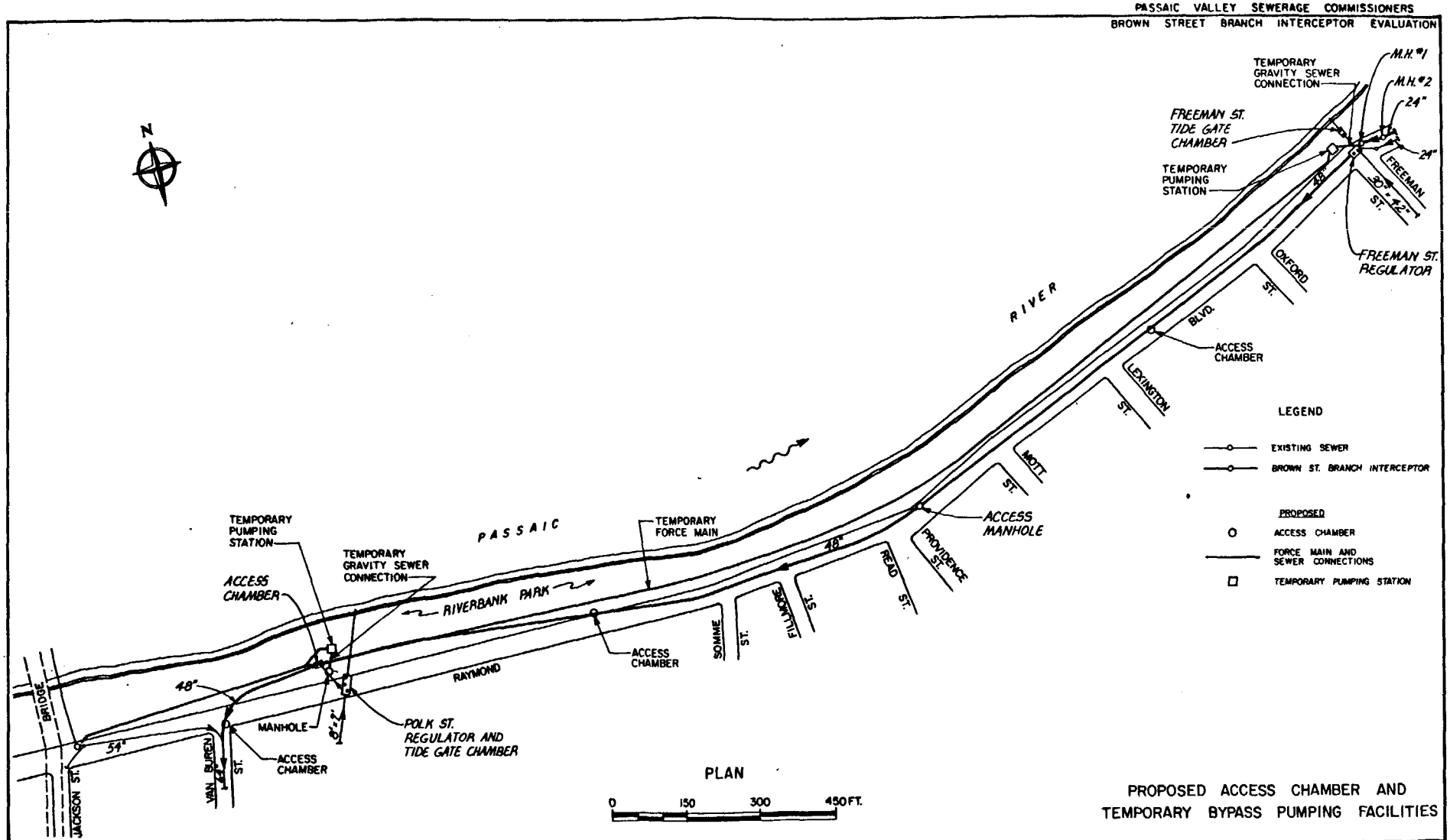
PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



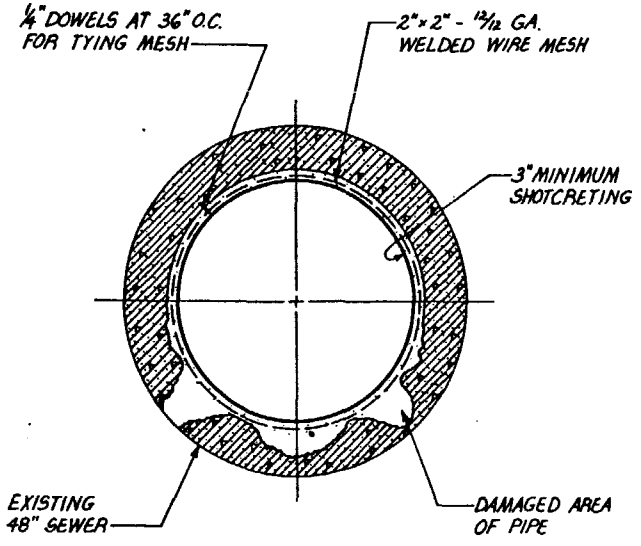
PROPOSED ACCESS CHAMBER AND TEMPORARY BYPASS PUMPING FACILITIES

CLINTON BOGERT ASSOCIATES

PLATE 9

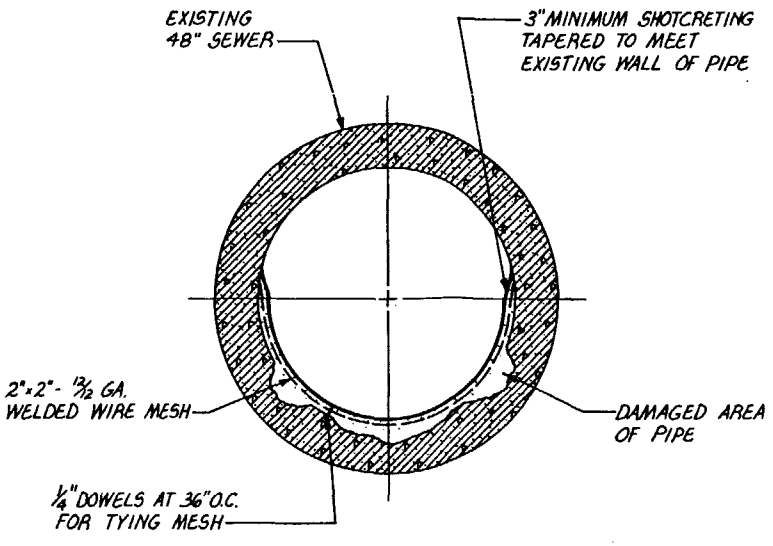
KLL010193

846570033



FULL SECTION

VAN BUREN STREET INTERCEPTOR TO
POLK STREET ACCESS CHAMBER



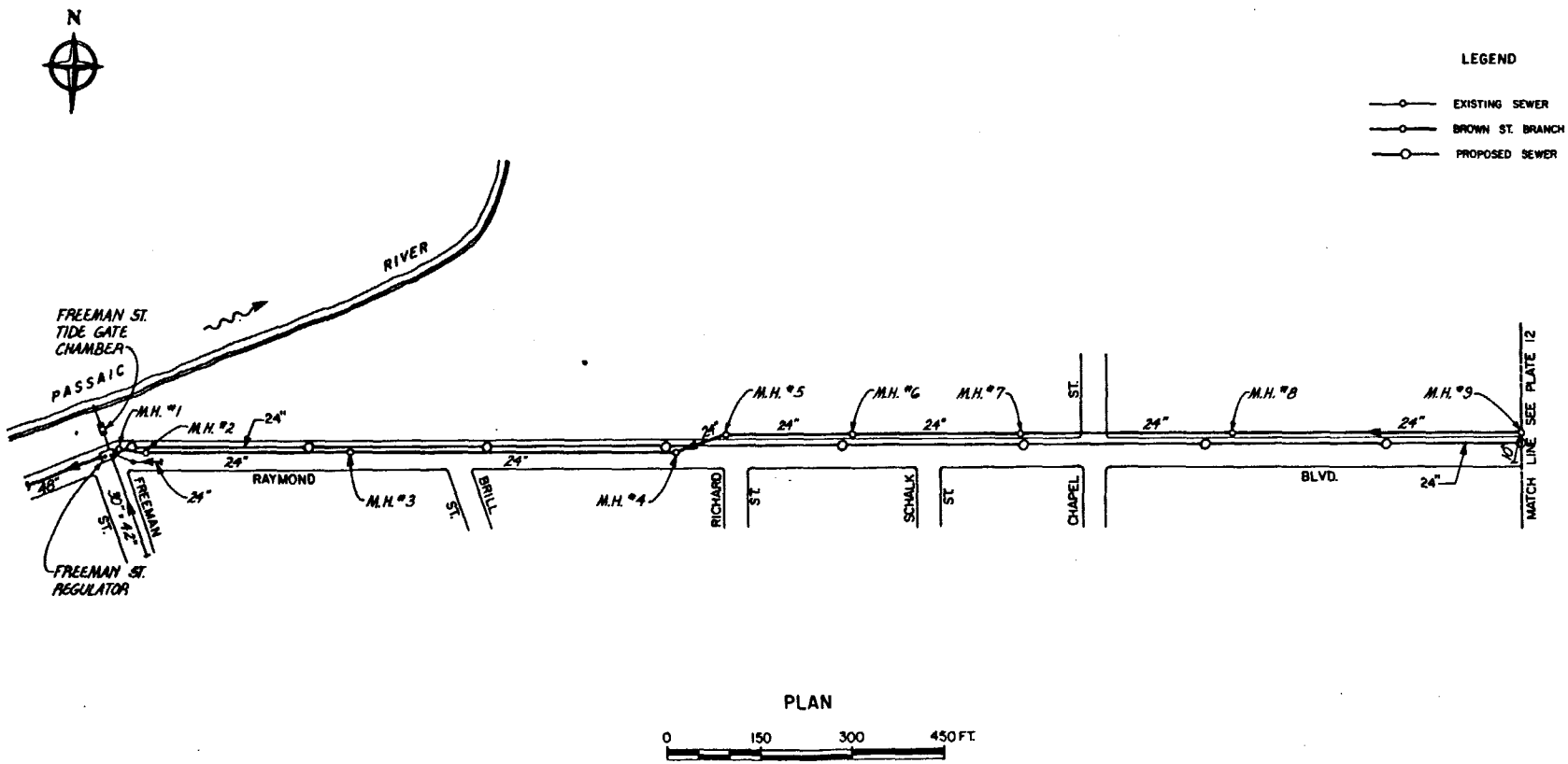
HALF SECTION

POLK STREET ACCESS CHAMBER TO
FREEMAN STREET REGULATOR

TYPICAL PROPOSED CROSS SECTIONS
TO RESTORE 48" INTERCEPTOR

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



PLAN

0 150 300 450 FT.

PROPOSED 24" INTERCEPTOR CONSTRUCTION

CLINTON BOGERT ASSOCIATES

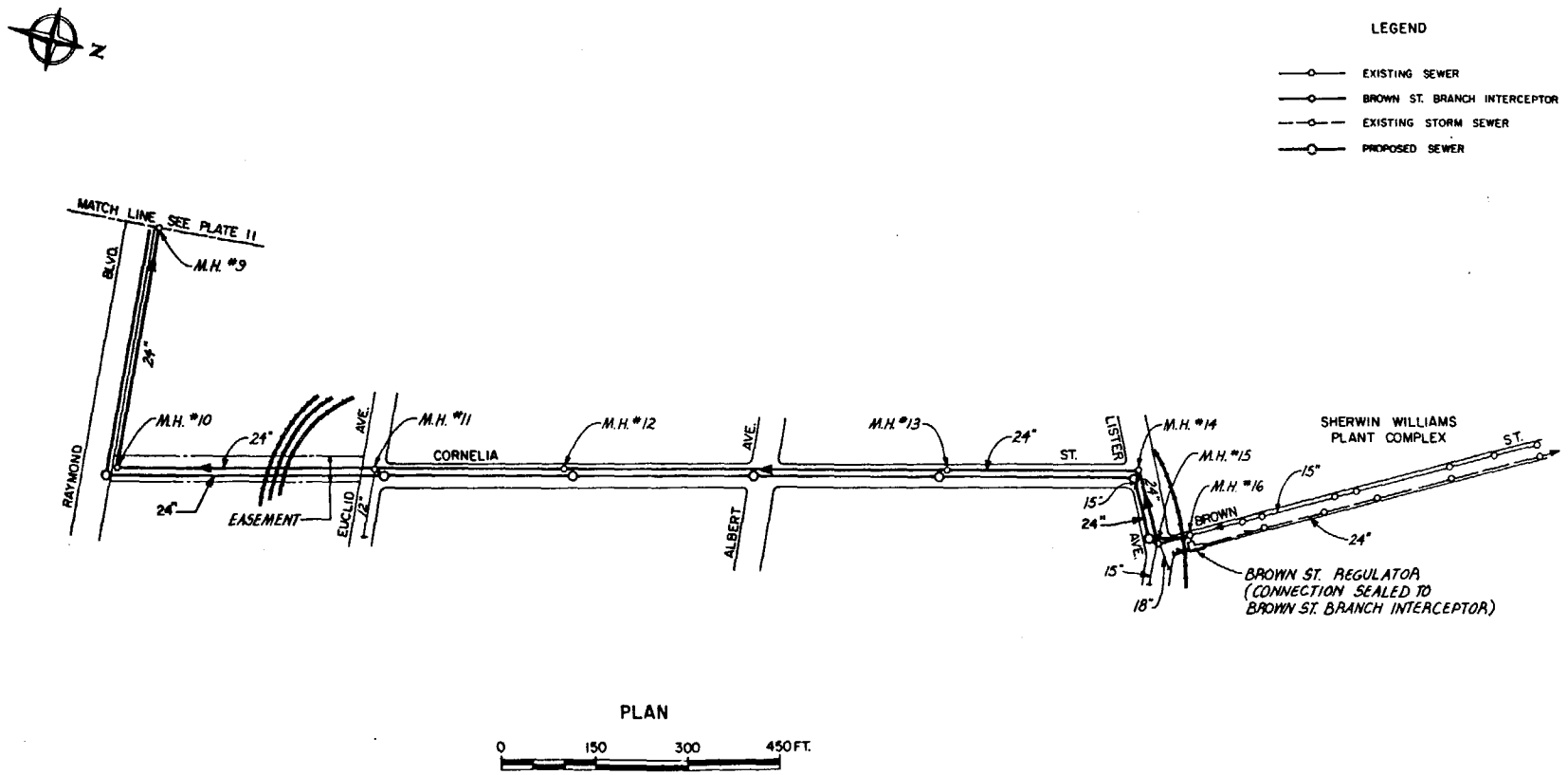
PLATE 11

KLLC10195

846570035

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR EVALUATION



PLAN

0 150 300 450 FT.

PROPOSED 24" INTERCEPTOR CONSTRUCTION

CLINTON BOGERT ASSOCIATES

PLATE 12

KLL010196

846570036

Appendix A

REPORT TO: Rocco D. Ricci, Chief Engineer
FROM: E.J. Moller, Mg'r. Line Eng'r.
DATE: March 4, 1980

SUBJECT: INVESTIGATION OF BROWN STREET INTERCEPTOR

An interior inspection of the four foot diameter portion of the Brown Street branch Interceptor was accomplished employing the Todds Underwater Contracting Company, to make visual observations. In addition to describing and fixing the location of all cracks, holes and other irregularities observed while crawling through a total of 2,450 of sewerline, measurements of the vertical and horizontal pipe diameters were made at twenty five foot intervals. A record was also made of the depth of muck or grit present along the bottom. The details of these observations are tabulated and located on the attached sheets. The stationing location is referenced to plan and profile drawing, Acc. NO. S-7586.

Except for specific areas, most of which were underneath areas where pavement cave-ins and ground subsidence had been observed in the past, and in the lower 275 ft. of pipeline between Polk Street and Van Buren Street, the interior condition of this concrete lined tunnel was found to be reasonably good, considering the fifty five years of exposure to chemical wastes coming from a highly industrial contributing area. Again, excepting local areas and excepting the section near Van Buren Street, the nature of the deterioration found was fairly uniform. Deterioration consisted of an erosion of the concrete below the normal water line (about a one third full pipeline) with the worst deterioration found right at the normal water surface, cutting grooves into each sidewall. Above this level the pipe interior was sound with width or height measurements of two diameters showing little to no loss of concrete.

In a number of areas, as shown on the attached drawing, the erosive action has progressed to a depth where the concrete sidewalls have been cut through, allowing the entry of groundwater with accompanying soil. As described in detail in the attached report by Mr. J. Lawrence, one of these badly deteriorated areas was found under Raymond Boulevard near Providence Street, below where previous road cave-ins had occurred. The heavy deposits of debris found along this length of sewerline confirming the road cave-in and the observed condition of the penetrated sidewalls.

While the divers reports failed to note water entering through the grooves it should be appreciated that the diver was unable to give detailed locations on each hole as the grooved condition is continuous along both sidewalls, with variable groove depth. It was not practical to probe along each groove length endeavoring to locate hidden through penetrations of the concrete. Also, since part of the groove was located below the waterline little observation could be made of entering groundwater. However,

it can be assumed, that considerable groundwater inflow is constantly occurring, considering the nature of the fine sand and gravel material tunneled through during original construction and the close proximity of the Passaic River.

In the seriously attacked sections of the sewerline the diver described the grooving as being of a honeycombed nature with through holes closely spaced. The situation in these areas is that while the sewer walls are penetrated, the top two thirds of the tunnel lining is not totally severed from the lower third. The sewer does not appear to be in structural danger, the danger is more to the undermining and threatening collapse of utility lines and road paving located above the sewerline.

The worst deterioration noted was in the section of sewerline running from the Polk Street connection to the end of the line where it connects into our Van Buren Street Branch Interce for. This is in a section where ground subsidences have occurred with frequency and where the Commissioners made a small repair to the line in the year 1972. It also may be mentioned that records exist of the Commissioners having taken action in the year 1927 against a Celluloid Manufacturing Company located on former Polk Street. The complaint was that they were discharging strong acids into the Polk Street sewerline which caused damage to our intercepting chamber. While no mention was made of damages to the concrete of our interceptor it can be assumed this contributed to the presently serious condition. Starting about a hundred feet downstream from the chamber the sewer sidewalls are badly grooved with large, elongated through cuts. As the diver approached the downstream 36" connection at Van Buren Street the recorded construction of a ten ft long transition section constructed from brick, was verified. It was reported that this section was in very bad shape with bricks missing - no brickwork apparent in the invert portion and large volumes of groundwater pouring in. At request, he crawled to the 36" opening in the 64 inch Van Buren Street sewer and reported that the main sewer appeared in good condition.

RECOMMENDATIONS

Now that the nature and magnitude of the problem has been determined, an engineering study to recommend repairs and/or replacements to the 48" diameter section of the Brown Street Branch Interceptor, must be instituted. While the threat to our sewerline, or its hydraulic carrying capacity is not immediate, the serious danger is to the ground above our line and to the utilities adjacent. Above our sewer are located high voltage electrical duct lines, telephone ductlines, gas and water pipelines. Also, in some sections the pavement of heavily traveled Raymond Boulevard. Underground voids are growing constantly at unknown rates, some of which in the past have reached the surface. These voids will continue until such time as we stop soil movement into our line by the action of infiltrating water.

Methods available to accomplish the above repairs can be divided into the categories of; pipeline replacement, internal repairs and external repairs. This line was originally installed as a compressed air tunnel and because of this it has pecularities which will affect the final decision on which methods are utilized. To facilitate tunneling, the line was installed in a diameter considerably larger than hydraulically necessary, at a greater depth than needed and without the usual spacing of access manholes. The last factor will call for the construction of some number of new access

shafts, as part of any of the methods selected.

It can be stated with reasonably certainty that compressed air tunneling methods will not be utilized again, due to their high labor cost. Internal repairs could consist of; inserting a new lining of smaller diameter; or sealing the holes, patching the grooves, then cement lining the interior by machine methods.

Which method is the best, at the lowest cost can only be determined by an in-depth engineering study. As a preliminary estimate it is felt by the writer that some combination of internal repairs between Freemen Street and Polk Street will be the best and most economical while the section of line between Polk Street and the Van Buren Street connection will best be replaced in its entirety by a new line using a new point of downstream connection.

In addition to the outlined work of sewer repairs or replacements will be the consideration of, handling sewage flows and a filling-in of existing voids. As part of the engineering study, flows from the contributory area must be evaluated in regard to their handling during construction and as to the size of interceptor sewer actually necessary. Fortunately, the character of the sewers in this area of Newark have changed since the original design and storm input has considerably lessened. With only two points of storm input into the length of sewer-line under repair their handling should not be difficult. The last consideration of filling in voids most included because as stated, the greatest danger is to the existing utilities and our liability for their disruption. Performing the repairs may not eliminate underground caverns which could now exist, especially if repairs are made from the sewer inside. Exploratory drillings of some sort must be done, at least in the hard surfaced roadway areas. Voids of any magnitude found must be filled.

APPENDIX

The following five sheets tabulate notes made of the inspectors reportings as they performed their runs. Since their cable allowed only 500 feet on the first night (increased to 750 feet on the second night) the sections between Polk to Providence and Providence to Freeman were done half way in from each end. The inspectors stationing and the clock method used for positioning points along the interior circumference are particular to the direction of each run as the data was not changed from the inspection notes. While changing would establish continuity, it is felt that by reversing the stationing there would be a loss of understanding regarding the sequencing of observations. To establish continuity, consecutive numbering was given to each set of observations, starting at the Van Buren Street end and running to Freeman Street.

The plan lengths of sewer are as follows:

Section No. 1	Van Buren to Polk Street	275'
Section No. 2	Polk Street to Providence Street	1210'
Section No. 3	Providence Street to Freeman Street	962'
		2447 Ft.

The internally measured lengths were:

Run No. 1	Polk Street to Van Buren Street	278'	-
Run No. 2	Polk Street eastward	475')	1225'
Run No. 4	Providence Street Westward	750')	
Run No. 5	Providence Street Eastward	500')	950'
Run No. 3	Freeman Street Westward	450')	
		2,453 ft.	

Run No. 1

INSPECTION, BROWN ST. BRANCH INTERCEPTOR

DATE: September 16 & 17, 1979
PERSONNEL: P.V.S.C.& Todd Diving Co.
SECTION: Polk St. Chamber to Van Buren Street (278' West)

DRAWING REFERENCE NO.	STATION OF INSPECTOR	DIAMETER 3 - 9 O'CLOCK	DIAMETER 6 - 12 O'CLOCK	DEPTH MUCK	REMARKS
20	0	55"		NONE	Entrance from Chamber, erroded.
19	0+25	48"	49½"	NONE	
18	0+50	48"	49"		Water 6" deep.
17	0+75	47"	49½"	1"	Gravel & muck.
16	0+98	48"	55"	SOFT	Hole at five o'clock, 12"x6' long. Grooves at 4 & 8 o'clock
15	1+23				Holes at 2 & 7 o'clock, 1' long.
14	1+25	46½"	49"		Groove at 5 o'clock, 1' long, 3" to 4" deep
13	1+27				5 & 7 o'clock, holes 6" to 12" high continuir
12	1+47				Holes end. Wall 1" thick
11	1+50				Hole at 5 o'clock, 2' lo
10	1+53				Hole at 5 o'clock ends. Small
9	1+63				Groove at 7 o'clock, 3" x 6" long. Groove at 7 o'clock, 6" x 7' long by 3" to 4' high. 5 o'clock groove, 1½' long by 3" to 4" hig
8	1+75	46½"	50"		Pipe in better condition
7	1+95				5 o'clock groove 1.5" lo by 12" high.
6	2+00	48½"	51½"	1/2"	Water 6" to 7" deep. Pipe bends to the left water washing in hole at 5 o'clock.
5	2+23	48"	52"	1"	2' long by 6" high.
4	2+25	46"	52"		
3	2+50				Bottom of pipe gone, holes at 5 & 7 o'clock, heavy inflow of water.
2	2+68	Brick transition starts with 20% of bricks missing, holes at 5 & 7 o'clock.			
1	2+78 (2+75)	36" connection into Van Buren St. main.			

KLLC10202

846570042

RUN NO. 2

INSPECTION, BROWN ST. BRANCH INTERCEPTOR

DATE: September 16 & 17, 1979
PERSONNEL: P.V.S.C.& Todd Diving Co.
SECTION: Polk St. Chamber toward Providence St. (475' East)

DRAWING REFERENCE NO.	STATION OF INSPECTOR	DIAMETER 3 - 9 O'CLOCK	DIAMETER 6 - 12 O'CLOCK	DEPTH MUCK	REMARKS
21	0+00	48"	47"	3"	Water 4" deep, reinf. ro at 8 o'clock.
22	0+25	48"	49"	6"	Loose rocks & gravel on bottom.
23	0+50	48½"	48"	1"	Pipe in good condition
24	0+66		69"		Hole at 4 o'clock, looks like a crack 10' long.
25	0+75	48"	50"	9"	Hole at 4 o'clock contin
26	1+00	48"	49½"	9"	2" grooves at 4 & 8 o'cl 7" water
27	1+25	48½"	49"	9"	2½" grooves at 4 & 8 o'c 4" water
28	1+50	47½"	50"	5"	2½" grooves at 4 & 8 o'c 8" water
29	1+70				5" groove at 4 or 5 o'cl very bad
30	1+75	48"	50"	5"	6" groove at 4 & 8 o'clo 10" water.
31	2+00	48"	49"	5"	2" groove at 4 & 8 o'clo 8" water.
32	2+25	48"	49"	8"	1½" groove at 4 & 8 o'cl 5" water
33	2+50	48"	48½"	5"	Slight groove at 4 & 8 o'clock, 5" water
34	2+75	47"	49"	5"	1½" groove at 4 & 8 o'cl 4½" water
35	3+00	47"	49"	9"	1" groove at 4 & 8 o'clo 5" water
36	3+25	48"	49"	8"	2" groove at 4 & 8 o'clo 9" water
37	3+50	48"	49"	8"	2" groove at 4 & 8 o'clo 7" water
38	3+75	47"	48½"	14"	5½" groove at 3 & 9 o'cl 6" water (Bad)
39	4+06	47"	48"	12"	5" groove at 3 & 9 o'clo 8" water
40	4+25	47"	48½"	14"	4" grrove at 3 & 9 o'clo 7" water
41	4+50	48"	48½"	12"	3" groove at 4 & 8 o'clo 8" water
42	4+75	48"	48"	14"	3" groove at 4 & 8 o'clo 8" water.

RUN NO. 3

INSPECTION, BROWN ST. BRANCH INTERCEPTOR

DATE: September 16 & 17, 1979
PERSONNEL: P.V.S.C.to Todd Diving Co.
SECTION: Freeman St. Chamber towards Providence St. (450' West)

DRAWING REFERENCE NO.	STATION OF INSPECTOR	DIAMETER 3 - 9 O'CLOCK	DIAMETER 6 - 12 O'CLOCK	DEPTH MUCK	REMARKS
114	0+00			14" - 15"	Fill at pipe entrance
113	0+25	47"	48"	12"	Muck, rocks & gravel, 4" water
112	0+50	48"	47½"	12"	Pipe looks good, 4" water
111	0+75	49½"	49"	12"	Pipe looks good, 4" water
110	1+00	49"	48"	12"	Mixed rocks, gravel and silt, 4" water
109	1+25	49"	48½"	12"	3" deep grooves, 5 & 7 o'clock
108	1+50	48½"	49"	10"	Grooves, 5 & 7 o'clock, no holes.
107	1+75	48"	48½"	10"	grooves, 5 & 7 o'clock, no holes.
106	2+00	47½"	49"	9"	2"-3" grooves, 5 & 7 o'cl small holes.
105	2+25	48"	48½"	8"	Same erosion Pipe bends to right
104	2+50	48"	49"	10"	Groove, 5 & 7 o'clock
103	2+75	48½"	48½"	10"	5 small holes, 3" high, 1" long
102	3+00	49"	48"	10"	
101	3+25	48½"	48"	9"	Grooves, 5 & 7 o'clock
100	3+50	49"	48"	8"	6" water
99	3+75	48½"	48"	10"	Grooves, 6" water
98	4+00	48½"	48"	10"	6" water
97	4+25	48½"	49"	8"	Grooves, pipe looks bett (grooves run under the w
96	4+50	48½"	48½"	7"	6" water

Run No. 4

INSPECTION BROWN STREET BRANCH INTERCEPTOR

Date: October 14 & 15 1979
Personnel: P.V.S.C. & Todd Diving Co.
Section: Manhole at Providence Street to 750' West

DRAWING REFERENCE NO.	Station OF INSPECTION	Diameter 3 - 9 O'CLOCK	Diameter 6 - 12 O'CLOCK	Depth Muck	Remarks
72	0+25	49½"	49"	6"	Slight Deterioration
71	0+50	47"	49"	5"	4 & 8 o'clock
70	0+75	48"	48½"	8"	4 & 8
69	1+00	48½"	49"	6"	4 & 8
68	1+25	48"	48½"	8"	4 & 8
67	1+50	47½"	48½"	9"	4 & 8
66	1+75	48"	48½"	10"	4 & 8
65	2+00	48"	48½"	6"	4 & 8
64	2+25	47½"	48½"	8"	4 & 8
63	2+50	48½"	48½"	7"	4 & 8
62	2+75	47½"	48½	8"	4 & 8
61	3+00	48½"	49"	8"	4 & 8
60	3+25	47½"	48½"	10"	4 & 8
59	3+50	48"	48½"	8"	4 & 8
58	3+75	48"	49"	10"	4 & 8
57	4+00	48"	49"	6"	4 & 8
56	4+25	47½"	48½"	10	4 & 8
55	4+50	48½"	48"	14"	Deterioration at 4 & 8
54	4+75	49"	48"	16"	o'clock Increasing up to 2"
		Silt building up such that it is almost impossible to pass.			
53	5+00	50"	47½"	12"	
52	5+25	49"	49"	10"	
51	5+50	48"	49½"	12"	
50	5+75	48½"	48"	12"	
49	6+00	48½"	49"	10"	
48	6+25	48"	49"	10"	
47	6+50	49"	48½"	8"	
46	6+75	48½"	49"	10"	
45	7+00	47"	49"	10"	4-10 52"
44	7+25	48"	49½"	11"	4-10 52"
43	7+50	49½"	48"	14"	4-10 51½"

Deterioration at the 4 & 8 o'clock position varied from 1 - 2" from Station 4+50 - 7+50

KLLC10205

846570045

RUN NO. 5

INSPECTION BROWN STREET BRANCH INTERCEPTOR

Date: October 14 & 15 1979
Personnel: P.V.S.C. & Todd Diving Co.
Section: Manhole at Providence Street to 525' East

DRAWING REFERENCE NO.	Station OF INSPECTOR	Diameter 3 - 9 O'CLOCK	Diameter 6 - 12 O'CLOCK	Depth Silt	Remarks
73	0+25	49½"	48½"	10"	1" ± 4&8
74	0+50	48"	48½"	9"	1½" ± 4&8
75	0+75	47"	48½"	8"	1½" ± 4&8
76	0+90	Small leak 2 o'clock			
77	1+00	47"	48"	8"	1" ± 4&8
78	1+25	47"	48"	8"	½" ± 4&8
79	1+50	47½"	48"	7"	3/4" ± 4&8
80	1+55	Small leak 11 o'clock			
81	1+75	47½"	48½"	6"	1" ± 4&8
82	2+00	48"	48½"	8"	1½" ± 4&8
83	2+25	48"	48"	4"	½" ± 4&8
84	2+50	48"	48"	6"	1" ± 4&8
85	2+75	48"	48"	8"	1" ± 4&8
86	3+00	48"	48½"	7"	1" ± 4&8
87	3+25	48"	48"	8"	1" ± 4&8
88	3+50	48"	48"	9"	1" ± 4&8
89	3+75	48"	48½"	9"	1" ± 4&8
90	4+00	48"	48"	11"	1" ± 4&8
91	4+25	48"	48"	12 &rocks	1" ± 4&8
92	4+40	Rocks in invert, 2" hole at 5 o'clock, probe goes right through			
93	4+50	47½"	47½"	13"	3" ± 4&8
94	4+75	48"	48½"	12"	probe bar goes through
95	5+00	48"	49"	10"	places

4+50 - 4+75, probe bar goes through 3" wear at 4&8 o'clock on occasion.

KLL010206

846570046

MEMORANDUM

TO: E. J. MOLLER

FROM: J. A. LAWRENCE

DATE: OCTOBER 18, 1979

SUBJ: INTERIOR INSPECTION BROWN STREET BRANCH INTERCEPTOR

During the night of October 14-15, 1979, an inspection of the interior of the Brown Street Branch Interceptor, not completed on September 16, 1979, was carried out. The area inspected was that section from the Providence Street Manhole 750' ± to the west, and 525' ± to the east. Every 25' measurements of the diameter of the pipe were made vertically and horizontally. The depth of muck and grit were also recorded. All cracks, holes and other irregularities were measured for depth, length and distance from the manhole.

On the run to the east, the muck or grit on the bottom generally averaged between 7" and 8" from the manhole to approximately Station 4 ± 25. There was a slight deterioration along the low flow lines at about the 4 and 8 o'clock positions throughout this section approximately 1/2" deep. Generally, the crown and invert were in good condition.

As there had been several large cave-ins of the pavement on Raymond Boulevard at approximately 475-500' east of the manhole at Providence Street, this area required careful study. At Station 4' + 50, the silt and grit in the invert started to build up to a depth of 14". The deterioration of the side wall at the 4 and 8 o'clock positions increased noticeably. At about 475' west of the manhole, the silt and grit built up to a depth of approximately 16", such that the diver thought he might not be able to proceed beyond this point. The deterioration at the 4 and 8 o'clock positions increased to a depth of approximately 2". No holes were detected in the invert or crown, at about 500' W, the silt and grit decreased to between 12 and 10" in depth, while the deterioration varied about 1" in depth. From this point to approximately 750' west, the depth of silt and grit varied, from 8 to 11" in depth, the deterioration at 4 and 8 o'clock continued mostly about one inch in depth, sometimes approaching 2 inches; however, the crown and invert of the sewer appeared sound.

The inspection from the manhole to the east revealed conditions similar to those immediately west of the manhole. For approximately 400' east of the manhole the silt varied from 8 to 9" in depth. The deterioration at the 4 and 8 o'clock flow line was approximately 1" in depth, and the crown and invert of the sewer generally appeared sound.

RE: INTERIOR INSPECTION BROWN STREET BRANCH INTERCEPTOR

Approximately 425' east of the manhole, the silt and grit, with rocks intermixed, increased to a depth of 12". At approximately 440', at the 5 o'clock position, a large hole, 2" in diameter, was detected, which the probe penetrated right through. From this point to about 475', the deterioration at the 4 and 8 o'clock position increased to as much as 3" in depth, and occasionally the probe went right though the pipe. Conditions began to improve beyond this point.

Although the condition of the Brown Street Branch Interceptor is in need of repairs at the distances approximately 475-525 feet west of and 450-500 feet east of the manhole at Provident Street, the sewer is not in eminent danger of collapsing. If these repairs are not made, very probably the voids that have occasionally appeared in the pavement of Raymond Boulevard, will reappear. It also must be taken into consideration that the trunk electric line that feeds most of Newark, and trunk telephone cables between Newark and New York City, generally lay almost directly above the PVSC Branch Interceptor, and could be affected by any future cave-ins, caused by this sewer.

JAL/kl
cc: R. Ricci

Appendix B

PASSAIC VALLEY SEWERAGE COMMISSIONERS

BROWN STREET BRANCH INTERCEPTOR RECONSTRUCTION

ENVIRONMENTAL EVALUATION/ASSESSMENT

A. INTRODUCTION

1. Purpose and Objectives

This environmental evaluation has been prepared to assess the short and long-term environmental impacts of proposed alternatives for rehabilitation or reconstruction of the Brown Street Branch Interceptor.

Evaluation of short-term effects includes: air and water quality, impacts on land use, plant and animal life within the area, noise levels, temporary social impacts, traffic disruption along the interceptor corridor and community aethetics.

Evaluation of long-term impacts includes: the protection of vital community utility services, prevention of potentially hazardous utility and highway disruptions, water quality in the Passaic River, erosion control and preservation of the PVSC sewers.

A secondary objective of this environmental evaluation is to identify needs for additional studies, if required, for compliance with USEPA, NJDEP and other regulatory or local agencies as a result of plan selection and proposed design and construction-rehabilitation.

2. Background and Existing Conditions

Portions of Raymond Boulevard have subsided as a result of undermining. The undermining has been caused by groundwater and soil washing into holes in the Brown Street Branch Interceptor, located beneath the roadway. It is anticipated that further damage may occur to both Raymond Boulevard and the utilities located therein if this condition is not corrected.

The interceptor consists of 2,450± linear feet of 48-inch concrete-lined tunnel extending between Freeman and Van Buren Streets, and 4,400± linear feet of 24-inch sewer. The line runs in and along the rights-of-way of Raymond Boulevard and Cornelia Street in the City of Newark. Flow is westerly in the 48-inch line from a regulator at Freeman Street to its discharge into the Van Buren Street Interceptor. The Polk Street combined sewer flows into the line approximately three hundred (300) feet upstream of Van Buren Street. Several underground utilities are located directly above or immediately adjacent to the Brown Street sewer. These utilities include the main electrical transmission lines for the Essex generating facility, major telephone lines connecting New York City with the southeast and high pressure gas and water lines. The continued deterioration of this interceptor threatens the integrity of these utilities as well as the surface of Raymond Boulevard.

Chemical damage to this interceptor was first detected in the 1930's. Industries were fined at that time for dumping acidic wastes. The condition of the sewer became a matter of serious concern in the 1970's when portions of Raymond Boulevard and the adjacent park began to subside. Hazardous conditions were created in the roadway and several utility lines were exposed. In 1972, localized repairs were made immediately downstream of the Polk Street connection. Subsidence continued to occur at various points along the interceptor. The most serious settlement occurred in 1979 at the Raymond Boulevard-Van Buren Street Intersection. Traffic was dis-

rupted and the telephone ducts were exposed and undermined at that time.

To date, all roadway settlement has occurred over the 48-inch tunnel section. This portion of the sewer was inspected October 14-15, 1979 by a diver.

It was found that the sewer was damaged along its entire length and that there was severe deterioration in the downstream section. The diver reported that 20 percent of the bricks were missing from the transition section at Van Buren Street. Numerous holes, soft spots and grooves were found between Van Buren and Polk Streets. Measurements in this section show that the circular cross section was compressed horizontally and elongated vertically at some locations. This movement suggests a dangerous loss of structural integrity. Upstream of Polk Street, continuous grooves and occasional holes were found below the springline. The cross section remained circular and there was no indication of loss of structural integrity. In almost every case, the holes reported by the diver coincided with areas of surface subsidence. The internal inspection findings indicate that immediate action should be taken to prevent structural failure downstream of Polk Street.

The condition of the 24-inch segment is unknown, but structural or hydraulic capacity problems may exist therein.

The potential environmental hazards have been noted for the aforementioned condition in a report to Rocco D. Ricci, Chief Engineer for PVSC from E.J. Moller, Manager Line Engineer, dated March 4, 1980, based on the diver's investigation, from which the following have been exerpted:

"...the nature of the deterioration found was fairly uniform. Deterioration consisted of an erosion of the concrete below the nor-

mal water line (about a one-third full pipeline) with the worst deterioration found right at the normal water surface, cutting grooves into each sidewall. Above this level the pipe interior was sound with width or height measurements of two diameters showing little to no loss of concrete."

"...the erosive action has progressed to a depth where the concrete sidewalls have been cut through, allowing the entry of groundwater with accompanying soil."

"...one of these badly deteriorated areas was found under Raymond Boulevard near Providence Street, below where previous road cave-ins had occurred. The heavy deposits of debris found along this length of sewerline confirm the road cave-in and the observed condition of the penetrated sidewalls."

"...considerable groundwater inflow is constantly ocurring, considering the nature of the fine sand and gravel material tunneled through during original construction and the close proximity of the Passaic River."

"...The sewer [sections of the 48-inch sewer] does not appear to be in structural danger, the danger is more to the undermining and threatening collapse of utility lines and road paving located above the sewerline."

"...While the threat to our sewerline, or its hydraulic carrying capacity is not immediate, the serious danger is to the ground above our line and to the utilities adjacent. Above our sewer are located high voltage electrical duct lines, telephone duct lines, gas and water pipelines. Also, in some sections the pavement of heavily traveled Raymond Boulevard. Underground voids are growing constantly at unknown rates, some of which in the past have reached the surface.

These voids will continue until such time as we stop soil movement into our line by the action of infiltrating water."

Based on the aforementioned observations, it is anticipated that the long-term environmental impacts of this project will be decidedly positive due to the necessity of planned corrective measures to rectify the existing potentially hazardous conditions along the interceptor corridor.

B. ENVIRONMENTAL SETTING

1. Location and Environment

The Planning Area considered in the environmental evaluation lies in the northeast sector of the City of Newark in Essex County in the highly urbanized New York-northeast New Jersey metropolitan area. The interceptor corridor runs from Brown Street, located about 600 feet south of the Passaic River, along Lister Avenue for 150 feet, then turns into Cornelia Street running south for about 1600 feet and then runs north for about 5100 feet along Raymond Boulevard, a main thoroughfare. The physical environment is heavily industrialized, unalterably changed by commerical development with almost no remaining evidence of its former natural state. The Passaic River and its shoreline comprise virtually the only veritable ecozone of scenic character.

2. Topography

The Planning Area is in the Triassic Lowland section of the Piedmont Physiographic Province, which is characterized by gently rolling plains. The interceptor corridor traverses flat city paved streets and also includes some gently sloping unpaved areas along the south bank of the Passaic River. Riverside Park, located between Mott Street and Van Buren Street, borders Raymond Boulevard on the

north side and slopes gently downward toward the River. The park includes grassy areas and a pedestrian walkway with no facilities for park sitting or recreational use. Drainage facilities along the corridor route are amply provided for with inlets to separate storm sewers that discharge to the Passaic River or to combined sewers that intercept and regulate storm water flow.

The designation of Flood Hazard Areas is the responsibility of the NJDEP which are defined by the inundated area of the 100 year flood. This delineation is determined by the U.S. Department of Housing and Urban Development (HUD). Based on HUD's Flood Insurance Map No. 12, Sheets 7 and 8, the planning area is not located in the 100 year flood or 100 year coast storm flood hazard area.

3. Climate and Air Quality

The climate for the Planning Area is characterized by warm summers and moderate winters. The mean annual temperature as measured at Newark International Airport is 53.8°F. The maximum average monthly temperature is 76.4°F and occurs during July, while the minimum average monthly temperature is 31.4°F and occurs during January. Temperatures at or below freezing begin around November 2 and last through April 7. The average annual precipitation for the planning area is 41.5 inches, with the highest monthly average of 4.28 inches occurring in August. In general, precipitation is distributed evenly throughout the year, approximately three to four inches per month, with measurable precipitation occurring on the average 123 days per year. "Northeasters," storms which occur predominantly in the fall and winter, account for a considerable part of the total precipitation. These storms last for two or more days and often result in one to two inches of rainfall. Snowstorms producing two or more inches of snow generally occur twice per winter, but may occur up to five times per winter.

Prevailing winds are from the west and southwest, but shift to the northeast during the winter months. The mean annual windspeed is 10.2 mph.

Air quality in the Newark Planning Area has been slowly recovering. The responsibility for monitoring air quality belongs to the NJDEP Division of Environmental Quality, Bureau of Air Pollution Control. Concentrations of SO_2, CO and NO_x have declined over the past ten years while Suspended Particulates, Hydrocarbons and Ozone levels have not changed appreciably.

4. Geology and Soils

The Brunswick Formation of the Newark Group of Late Triassic Age underlie all of the planning area in the City of Newark. The Brunswick Formation is dominantly shale and sandstone but also includes minor amounts of conglomerate. Overlying the rocks of the Newark Group are unconsolidated sediments deposited during the Pleistocene and Recent Epochs by glaciers or glacial meltwater. These sediments are classified as stratified drift and consist of stratified sand, sand and gravel and silty sand and gravel. General characteristics include assorted, relatively homogenous soil, predominantly of sand-sized grains with varying amounts of silt and gravel. Gravel often occurs as layers or beds of varying thickness and extent. Mineralogical composition includes sandstone, gneiss and quartz crystals with the sandstone particles most prevalent. Color is yellow-brown where derived from igneous and metamorphic rocks and red-brown where derived from shale and sandstone. The Engineering classification ranges from HRB A-1-a to A-2-4 which is a sandy soil with varying percentages of gravel and/or silt. Drainage is generally good because of the granular nature of the soil.

Depth to water table is about 6 to 10 feet. Streams and rivers draining the Newark area before the last glaciation cut deep valleys

into the Triassic rocks. These valleys were subsequently buried by glacial debris and the thickness of the glacial deposits is largely controlled by the underlying bedrock topography. The altitude of the floor of the buried bedrock valley under the Newark area varies as much as 50 to 280 feet below sea level and the glacial drift occupies this height.

5. Ecology

The biological, physical and chemical components of an area's environment interact in complex ways to produce ecological systems. In the Planning Area they are: the Terrestial System and the Passaic River.

a) The Terrestrial System

The Terrestrial System is herein regarded as the dry land in the Planning Area. All of this area is heavily urbanized. Its natural components consist primarily of parks, including Riverside Park, vacant lots and the ballfield located across from Raymond Boulevard. These areas contain some trees, reed grass, ornamental plantings and provide a limited habitat for birds and mammals. It is unlikely that these areas would suffer ecological decline from single disturbances.

b) Passaic River

In the Planning Area, the short reach of this river is considerably stressed by organic matter inputs. The resulting low dissolved oxygen concentrations here have, in turn eliminated many benthic and zooplankton species. A number of fish species which spend part of their lives in the ocean have been found in the Passaic, upstream of the planning area. This indicates that the lower reaches in the planning area are not impassable, al-

though it does not appear that this section can itself support a balanced, diverse biological community. However, due to the elimination of organic pollutants, the aquatic environment is recovering.

The Passaic River is tidal and navigable in the Planning Area. The minimum seven-consecutive-day low flow with a ten year return period into the estuary is 23.1 cfs (14.9 mgd). The average long-term flow upstream at Little Falls is estimated at 858 mgd.

Little water quality data is available for the reach of the Lower Passaic River in the Planning Area. The Lower Passaic River receives flows from municipal and industrial point sources, and urban runoff. Dissolved oxygen concentrations two miles upstream from the river's mouth at Newark Bay average 2.2 mg/l during summer, below the 3.0 mg/l standard for TW-3 waters. The D.O. level rises on approaching Newark Bay and the TW-3 D.O. level is met in the Bay. Summer dissolved oxygen concentrations in the Lower Passaic River have increased or have not declined significantly in the period from 1968-1975. Summer 1970 fecal coliform levels in the portion of the Passaic River within the Planning Area were within the 1500 mg/l standard for TW-3 waters. Total Kjeldahl nitrogen (ammonia and organic nitrogen) concentration was about 3.5 mg/l, nitrate-nitrogen concentration was in the range of 1-2 mg/l, phosphate concentration was slightly above 1 mg/l and the suspended solids concentration was in the range of 30-35 mg/l.

A zone of settling has become evident in the tidal areas of the Passaic River. The primary sources of settleable solids are storm sewer discharges and combined sewer overflows. The largest dissolved oxygen deficit in the Lower Passaic River is caused by benthic oxygen demand, while the next largest oxygen demand is caused by non-point source runoff loadings. Due to this situation, dissolved oxygen

levels in the Lower Passaic River are not expected to improve substantially, unless non-point sources and intermittent point sources are controlled.

6. Noise Levels

Unwanted or annoying sounds are a form of pollution of significance in the modern environment. Noise levels may vary greatly from one point to another in the environment, since by nature, noise is a non-persistant form of pollution. Therefore, noise levels will vary in the Planning Area depending on the proximity to noise sources. Local area-specific noise inventory data are very incomplete, however, a general conception of the noise levels in the area is presented.

High noise levels are generally attributed to transportation related activities. Noise levels in an urban setting fluctuate on a daily, diurnal and seasonal basis. Daily fluctuations generally rise and fall with the amount of human activity, and this may be directly related to the amount of traffic inherent to a given area. Daytime noise levels are higher than night time noise levels. Seasonal variations also occur with winter readings generally being the lowest due to less outdoor activity.

Changes in traffic flow alter decibel readings on a diurnal basis. Peak flow conditions, or "rush hours," can generate noise levels of up to 15 dBA higher than low traffic flow hours, for heavily traveled roads. This fact indicates that noise levels will vary with the time of day at a specific site, and also from measurement location to location.

Since traffic may be made up of many different vehicles combining to form a "line source," the level of noise from each individual vehicle adds to the overall noise levels. This occurs when suffi-

cient numbers of automobiles are present so that single vehicle noise is not observed. General ranges for traffic noise may be categorized into heavy traffic, 75-88 dBA; average traffic 65-75 dBA; and light traffic 65 dBA or less. It is understood that vehicle speed will alter the noise level as will the vehicle mix (ratio of cars to trucks).

Urban traffic is prevalent throughout the region. Thus noise levels are relatively high. Average noise figures for neighborhoods in the study area must consider the type of neighborhood and the traffic within this area. Generally for residential areas noise levels may range from 55-70 dBA with 55 dBA indicative of a surburban area, while 70 dBA may be considered a very noisy urban area on a major street. Industrial areas or city noise in a busy downtown area may range as high as 65-80 dBA.

In addition to the vehicular traffic, railroad tracks cross the area. Furthermore, Newark International Airport is close enough to the Planning Area to make aircraft another potentially significant noise source. Rail traffic may generate noise levels from 73 to 96 dBA at 100 feet from the track depending on the speed of the train, while aircraft noise levels may be higher than this (over 100 dBA) depending upon the proximity to the airport and the type of aircraft. Air and rail traffic will vary with the season, the day of week, and with time of day, as well as with weather conditions.

High noise levels have been shown to have physiological and psychological effects on human beings. In most cases the effect is observed only during and shortly after an exposure to noise. Noise levels have been shown to interfere with hearing and sleep. Sleep deprevation is, in fact, one of the major noise related problems. A lack of sleep, or a lack of one of the several stages of sleep, may eventually have detrimental effects on an individual's health.

High noise levels have also been proven to cause hearing loss. At present, for example, continued exposure to noise levels over 90 dBA is prohibited indoors by the Walsh-Healey Act. A proposal is presently being considered by OSHA to lower this level to 85 dBA. A temporary threshold shift in hearing may occur upon exposure to loud noises. This causes a temporary loss of hearing in certain frequency bands. The amount of time necessary to return the normal hearing will depend upon the length and intensity of exposure to a noise by an individual. Continued exposure to high noise levels may cause permanent hearing loss. Common levels of noise found in the environment are provided in the following table.

Less direct or tangible effects of noise are physiological stress, annoyance and task interference. These effects are more difficult to define because they are not exclusively produced by noise, nor are they simple functions of the noise level. An individual may react differently to different noise levels and specific noise conditions. Thus noise levels may adversely affect an individual to different degrees depending on the person's own psychological response to the noise. It is clear that an increasingly noise filled environment interferes with human well-being.

COMMON ENVIRONMENTAL NOISE LEVELS

Sound Pressure Level dBA	Environmental Condition
0	Threshold of hearing
10	Rustle of leaves
20	Broadcasting studio
30	Bedroom at night
40	Library
50	Quiet office
60	Converstional speech (at 1 m)
70	Average radio
74	Light traffic noise
80	Typical factory
90	Subway
100	Symphony orchestra
110	Rock band
120	Aircraft takeoff
140	Threshold of pain

Source: Our Acoustic Environment, Frederick A. White

7. Archaeologic and Historic Resources

No archaeologic resources are known to exist in the Planning Area. No archaeological sites have been identified although the region as a whole was formerly inhabited by native American Indians. Artifacts from the Paleo-Indian, Archaic and Woodland Traditions, as well as the Contact Period with European Settlers have been found in the Essex County area although the potential for new finds in the Planning Area is limited due to:

1) previous disturbance of subsoils through development within the area, and

2) limited subsurface disturbances or excavations for new or planned rehabilitation work in intrinsically new archaeologic/historical areas not formerly disturbed by development.

The Morris Canal which formerly traversed the Planning Area between the interceptor corridor and the Passaic River may be one of the only historical resources of interest. Opened in 1830 from Phillipsburg to Newark and extended to Jersey City in 1835, it used an ingenious but costly system of locks and inclined planes that literally made the canal "climb hills." The Morris Canal brought markets closer and made it easier to transport Pennsylvania's anthracite coal to iron furnaces in North Jersey. Although bringing radical changes and prosperity to North Jersey, the canal had only a momentary burst of prosperity during the Civil War. After the Civil War, the railroads dominated the major transportation markets and by 1871 the canal was leased to the Lehigh Valley Railroad and was later abandoned in the 1920's. The land was filled in and sold to private owners and municipalities and is only partially recognizable by contours in some areas. In the Planning Area, the canal has been filled in and in most cases paved over with no visible signs of its former presence. The likelihood of finding any historical remains is very doubtful due to the disturbed nature of the soils below paved areas. The Morris Canal is listed on the National Register of Historic Places.

8. Economic and Commercial Needs

The areas served by the Brown Street Interceptor are primarily industrial, commercial and lower class residential neighborhoods. Vital utility services including electrical, water and gas lines running above the interceptor on Raymond Boulevard are threatened by po-

tential disturbance or collapse. The protection of these services is essential to economic stability as well as environmental quality.

9. Environmentally Sensitive Areas and Endangered Species

The Planning Area is highly urbanized and is closely surrounded by urban land uses. There is no land suitable for cultivation. Soils do not present severe development constraints. There are no areas of undisturbed wildlife habitat, however the banks of the Passaic do support some wildlife despite the effects of urbanization and poor water quality. There are no environmentally sensitive areas in the interceptor corridor vicinity. The NJDEP's list of endangered and threatened wildlife species includes some species which may have been observed along the Passaic including:

1) Shortnose sturgeon
2) Peregrine falcon
3) Osprey
4) Atlantic tomcod
5) Yellow-crowned night heron

It is highly unlikely that any single disturbance due to construction or rehabilitation could endanger any of the above species in and around the Planning Area.

C. ALTERNATIVES FOR REHABILITATION OR RECONSTRUCTION OF THE BROWN STREET BRANCH INTERCEPTOR

Due to the potentially hazardous conditions along the 48-inch interceptor corridor it has been decided by PVSC to proceed with design for rehabilitation and reconstruction of this segment. Immediate action for the 24-inch line has been temporarily deferred to a later date, until such time that the location of the deteriorated sections of pipe are determined.

1. Alternatives for the 48-inch Interceptor

a) "No-action" - Baseline Condition.

b) Rehabilitation. The recommended plan is to rehabilitate the interceptor by the pressure injected concrete or "gunite" process. The sewer would be taken out of service by installing temporary bypass pumping facilities at Freeman and Polk Streets. Three (3) additional access chambers would be constructed to facilitate the rehabilitation work and subsequent maintenance operations. The interceptor would be cleaned and sandblasted. Holes would be sealed by injecting grout from the inside of the line. Steel mesh would then be anchored to the sewer walls and sprayed with concrete to fill voids and restore the sewer's structural integrity. Test pits would be constructed and borings taken at areas of surface subsidence. Grout, select fill and bracing would be placed as necessary to stabilize utilities. The construction cost of this rehabilitation effort is estimated at $2,200,000 with engineering, survey and borings costs totaling an additional $87,000. It is estimated that the cost of constructing a new 42-inch parallel interceptor would be in excess of $5,000,000. The pressure injected concrete process described herein will restore the interceptor's structural integrity and retain sufficient hydraulic capacity for present and future flows at the lowest cost.

2. Alternatives for the 24-inch Interceptor

a) "No-action" - Baseline Condition.

b) Television inspection to determine the extent of deterioration and structural stability.

c) Patch selected areas within the line where deterioration exists.

d) Removal and replacement of selected segments of the 24-inch line where deterioration exists.

e) Complete replacement of the entire 24-inch line.

Depending upon the extent of deterioration and damage determined from surveys and/or T.V. inspections, Alternatives c) through e) could be implemented. Due to existing lateral connections in the 24-inch interceptor, bypass pumping would not be feasible under Alternative e). Installation of a new line parallel to the existing 24-inch line and connections to laterals would be made. The old line would then be filled in with sand. Alternatives c) and d) would require some temporary bypass pumping from either segments of the 24-inch line or by intercepting lateral flows.

D. ENVIRONMENTAL IMPACTS OF THE "NO-ACTION" - BASELINE CONDITION

1. "No-Action" Alternative for the 48-inch Interceptor

The timing of the rehabilitation work is critically important, since the sewer is continuing to deteriorate and the ground above it is continuing to subside.

Extremely serious consequences would result from a collapse of this sewer. Occupants of vehicles could be injured if portions of the Raymond Boulevard caved in and the roadway would have to be closed for an indefinite period. A ruptured gas main could create a very hazardous situation. Several other utilities could be damaged if the high pressure water main burst and began undermining them. The failure of major electrical and telephone transmission lines

would cause service interruptions beyond the immediate area, and a collapse could completely block the interceptor causing millions of gallons a day of raw sewage containing potentially toxic industrial waste to be bypassed into the Passaic River. Even if a dramatic failure did not occur, continued subsidence could create hazardous conditions in Raymond Boulevard and threaten the integrity of utilities therein.

The extent of impact ranges from temporary disruption of vital utility services to the extreme situation where:

1) Severe pollution and degradation of the Passaic River for an extended period of time would result.

2) Injury and loss of life of residents and workers in the area could result due to traffic accidents, release of toxic substances, explosions of gas mains and fires from electrical and gas main damage.

The potential for these hazardous conditions to occur, places an immediate, high environmental priority on the implementation of the proposed rehabilitation work.

2. "No-Action" Alternative for the 24-inch Interceptor

The environmental impacts for the "No-action" Alternative range from mild effects such as minor subsidences to major collapse in affected areas on the order of calamity as noted for the aforementioned "No-action" Alternative for the 48-inch interceptor. Although the conditions are less severe along the 24-inch interceptor corridor at the present time, it could be simply a matter of time before conditions worsen. The character of the wastes conveyed by the 24-inch line are believed to be no less toxic or potentially hazardous as the wastes conveyed in the 48-inch line. Efforts should be made to de-

termine as soon as possible the effect of deterioration and structural stability along the 24-inch interceptor corridor.

E. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

1. Construction Impacts

Construction impacts are, for the most part, considered to be short-term in nature, usually from the start of construction until completion of the project. Because of their short-term nature, most construction impacts can be effectively mitigated.

Because the rehabilitation of the 48-inch interceptor will occur in the pipeline, the construction impacts will be substantially reduced. The impact of rehabilitation will be of a very localized nature -- limited to the immediate area of the interceptor corridor. There will be relatively little: construction-related traffic, disruption of through or local traffic in and around Raymond Boulevard, visual impacts, noise and dust. Since a large segment of the 48-inch interceptor runs alongside Raymond Boulevard on sidewalk areas and portions of the 24-inch line run under streets that bear a very light traffic load, traffic congestion will be minimized with appropriate detouring and traffic routing. Raymond Boulevard may have to be reduced in areas from a 3-lane to a 2-lane roadway with only minor traffic inconvenience. There will be minor impacts on surrounding commercial areas as a result of construction materials being delivered to the site.

Bypass pumping in and around park areas will involve restricting access in certain areas of the park. A bypass pipeline would be located above ground along with all necessary electrical service lines and cables for pump station operations. Restricting access will be in the interest of public safety and would not totally eliminate access to park and other areas. This is a relatively minor impact con-

sidering the present limited use made of park areas in the immediate area of proposed bypass pumping.

In addition, all effects of limited excavating and dewatering operations for structural rehabilitation and/or reconstruction will be minimized. Any excavated material will be disposed of in an environmentally safe manner acceptable to all cognizant regulatory agencies. Waters generated by dewatering operations will be desilted according to acceptable practices of the NJDEP and conveyed either to sewers or the Passaic River. No significant impact is anticipated from discharge of these waters because of the short duration of their discharge, the anticipated low flow volume and the large amount of dilution available in the Passaic River for this temporary discharge. To summarize, construction activities will not have a significant impact on the environment in the Planning Area.

2. Long-Term Impacts

Long-term impacts can be direct or indirect. Direct impacts result from the construction, location and/or operation of the facilities and generally remain in force for the life of the project or longer. Indirect impacts (secondary) result from various degrees of influence of project-associated activities in the service area.

a) Water Quality

The rehabilitation of interceptors will preserve the steadily improving water quality of the Passaic River. The "No-action" Alternative could potentially cause raw discharges of untreated toxic wastes into the Passaic River with subjection of deleterious chemicals to aquatic and estuarine life in the event of interceptor failure.

b) Terrestrial Environment

No long-term impacts are anticipated.

c) Geology and Soils

It is anticipated that improved structural soil characteristics will be made along the interceptor corridor in selected areas and reduction of soil movement and siltation into the sewer will occur. No geological disturbances are anticipated.

d) Air Quality

No long-term impacts are anticipated.

e) Archaeological-Historical

The effect of any disturbances to archaeological or historical areas will be minimized since rehabilitation will take place primarily inside an existing sewer. The Morris Canal which is presently filled in and buried will not be disturbed.

f) Rare and Endangered Species

No rare, endangered or threatened species will be impacted by the proposed project.

g) Population

No impacts on population are anticipated.

h) Land Use

No direct impacts on land use are expected.

i) Infiltration

Rehabilitation will result in a reduction of infiltration into the sewer.

j) Transportation Facilities

Rehabilitation will stabilize soils under roadways, prevent future subsidence and will preserve Raymond Boulevard as a vital and safe commercial roadway.

k) Public Utilities

Rehabilitation will protect vital public utilities which serve a vast commercial-industrial-residential complex including electrical, gas, water and telephone utilities.

F. MITIGATION MEASURES

Mitigation measures judged to be of importance with regards to the impacts of rehabilitation/reconstruction of interceptor facilities are:

1. Measures to Minimize Construction Impacts

The impact of this project will be minimized by: maintaining access routes to any commercial and industrial zones; periodically watering all areas of exposed soil to prevent dust; conducting construction activities round-the-clock, 24 hours per day, thereby minimizing the amount of work and disruption of traffic during normal rush hours; providing public notice of intended construction (i.e., via newspaper) explaining proposed routing of pipeline and expected duration of construction; following recommended OSHA guidelines for noise suppression, safety, etc., on construction sites.

2. Special Measures to Minimize Construction Related Impacts

a) Protection of all public utility services during construction will be a main priority with appropriate techniques to maintain the highest level of public and worker safety.

b) Restoration of landscaping should immediately follow construction phases in order to restore any affected areas (i.e., pavements, grassy areas, etc.) to their former or improved state.

c) Excavated material will be disposed of in an environmentally safe, acceptable manner.

d) Pumpings of silt-laden water from trenches or subsoil areas will not be discharged to any surface waters without prior treatment through de-silting operations.

3. Comparable procedures will be taken upon rehabilitation/reconstruction of the 24-inch interceptor.

G. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED FOR THE PROPOSED PROJECT

The unavailable adverse impacts of all alternatives are presented in Table 1. There are marked differences between the "No-action" alternatives and proposed rehabilitation/reconstruction alternatives with the "No-action" alternatives having greater adverse effects.

H. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The short-term use of man's environment involves the rehabilitation/reconstruction of the proposed project's facilities, the impact of which, on the natural environment, is largely temporary.

Digging and grouting may result in increased acoustic noise levels at intervals during work hours. Dust and dirt from exposed areas may also be a transient nuisance. Traffic patterns will be periodically disrupted by the movement of construction vehicles. All of these impacts are transient in nature and will disappear upon completion of construction.

The rehabilitation of the PVSC facilities will serve the sewage treatment needs of a vital residential, commercial and industrial area. It will also preserve vital public utilities and prevent future hazardous conditions, thereby maintaining the economic and environmental well-being of the area. In terms of land use, the proposed project will preserve existing land uses.

The proposed project will also provide some direct jobs and indirect spin-off jobs in an area of persistant unemployment and underemployment as a result of immediate construction.

The proposed project's contribution to the long-term productivity of the region and the immediate area is primarily a factor of public health and safety as well as an environmental and economic consideration. In terms of the natural environment, site productivity will remain essentially unchanged. However, when water quality considerations are evaluated, the need for maintaining sewerage collection facilities is evident with regard to maintenance and enhance-

ment of the natural biota, while providing for the protection, health and welfare of persons residing in the area.

I. IRREVERSIBLE ENVIRONMENTAL CHANGES AND IRRETRIEVABLE COMMITMENTS OF RESOURCES INVOLVED IN THE PROPOSED ACTION AS A RESULT OF IMPLEMENTATION

Rehabilitation of the proposed interceptor will involve certain irreversible and irretrievable commitments of resources.

The lost resources associated with any public works project are the raw materials and energy, both in terms of labor and natural energy that are applied to the project.

The proposed rehabilitation represents an investment of approximately $2,300,000 by State, Federal and participating municipalities. This represents an economic commitment necessary to implement the proposed project. However, this sum would be significantly less than the repair or replacement of sewers and utilities and the monetary loss incurred due to disruption of these services should the sewers fail due to omission ("no-action") or neglect. Therefore, the avoided cost of failure to the interceptor, utilities, potential loss of human life, disruption of services and deterioration of the environment is small by comparison in terms of both monetary and social and environmental values.

J. NO SIGNIFICANT ADVERSE IMPACTS

It is the conclusion of this environmental evaluation that there would occur no significant adverse environmental impacts as a result of implementation of the proposed project. There is also no foreseeable circumstance or environmental impact that should preclude the execution of the proposed project.

TABLE 1

SUMMARY OF UNAVOIDABLE ADVERSE IMPACTS OF ALTERNATIVES

Project Impacts	"No-Action Alternative"	Rehab./Reconst. Alternatives
Short-Term		
1. Temp. disruption of vegetation along interceptor corridor route	0	-
2. Temp. social impacts-dust, aesthetics, noise and traffic disruption along the interceptor corridor, restricted park access	0	-
Long-Term		
1. Potential damage to utilities, public health and safety	+	0
2. Air quality	-	0
3. Water quality	+	0
4. Odors	+	0
5. Loss of native vegetation and wildlife habitat	+	-
6. Change in land use patterns	0	0
7. Reduction of infiltration	0	0
8. Soils stability	+	0
9. Increased cost of wastewater and/or utility services	+	-
10. Energy demand and operations	0	0
11. Complies with State and Federal requirements	NO	YES

Degree of Adversity

\+ Major Impact
* Moderate Impact
\- Minor Impact
0 No Impact

CLINTON BOGERT ASSOCIATES

CONSULTING ENGINEERS

2126 CENTER AVENUE • FORT LEE, NEW JERSEY 07024
(201) 944-1676 • CABLE: BOGERTENG FORTLEENJ

PARTNERS
[illegible]

PRINCIPAL ASSOCIATES
[illegible]

ASSOCIATES
[illegible]

April 13, 1981

HAND DELIVERED

Passaic Valley Sewerage Commissioners
600 Wilson Avenue
Newark, New Jersey 07105

Attention: Mr. Rocco D. Ricci

Re: Brown Street Branch Interceptor
Evaluation

Gentlemen:

Our evaluation of the Brown Street Branch Interceptor is nearing completion and a draft report will be submitted in May. We have found that the downstream portion of the 48-inch sewer appears to have lost structural integrity. This is a matter of serious concern because a collapse could cause Raymond Boulevard to cave in, damaging utilities in the roadway and blocking sewage flow. It is our recommendation that the Commissioners consider immediate action to rehabilitate the 48-inch segment of this interceptor.

Chemical wastes have caused severe deterioration of the concrete and masonry in this sewer. The conduit no longer appears to be structurally sound between the Van Buren Street and Polk Street Interceptors. It's cross section is becoming elliptical rather than circular and the concrete has been penetrated through to the soil at several points. Many bricks have fallen from the transition section beneath the Raymond Boulevard - Van Buren Street intersection. We believe that industrial waste is continuing to deteriorate this sewer and that the probability of a collapse is rapidly increasing.

The consequence of a collapse would be extremely serious. Portions of Raymond Boulevard could cave in, possibly injuring occupants of vehicles and forcing the roadway to be closed for an indefinite period. utilities directly above and adjacent to the sewer could be damaged and lengthly service interruptions could occur. A very dangerous situation could result if a gas main was ruptured. The failure of major electrical and telephone transmission lines could create hardships in the area. A collapse could block the line causing millions of gallons a day of toxic industrial waste to be bypassed into the Passaic River. Even if a dramatic failure did not occur, continued subsidence could create hazardous conditions on Raymond Boulevard and threaten the integrity of the Utilities therein. Rehabilitative efforts should be initiated before further damage occurs.

Passaic Valley Sewerage Commissioners
600 Wildson Avenue
Newark, New Jersey 07105

CONSULTING ENGINEERS

Attention: Mr. Rocco D. Ricci

It is recommended that rehabilitation be carried out using the "gunite" process. Steel mesh would be anchored to the existing sewer walls and concrete sprayed over it to fill voids and restore the sewer's structural integrity. The technique was used recently to rehabilitate one of the Commission's interceptors in Paterson. The volume of flow in the line and the toxic nature of the waste will necessitate taking the line out of service while repairs are made. Temporary pumping equipment will have to be installed in the Polk and Freeman Street regulator chambers. A force main would be run along Raymond Boulevard to the Van Buren Street interceptor. Three (3) additional chambers will have to be built to facilitate rehabilitation and subsequence maintenance operations. Because of the exposed piping required in the bypassing operation, it will be necessary to complete the work before the onset of cold weather. Prompt and coordinated action will be necessary to accomplish this objective.

To expedite design of the required facilities the present Clinton Bogert Associates contract could be amended to allow design of the chambers and preparation of plans and specifications for the gunite work. Construction work could be advertised in June or early July and a contract subsequently awarded to cover construction of the chambers and repair of subsidence area; and to cover the gunite repairs and bypass pumping. The chambers could be constructed while the bypass pumping equipment is being installed. Once the conduit is out of service, the gunite work could begin. This effort could continue around the clock until repairs were complete. The downstream section of the 48-inch sewer should be repaired first. Using this approach, repairs could be completed by December 1981. If the proposed work cannot be implemented soon, rehabilitative efforts will have to be delayed until the Spring and Summer of 1982.

We are of the opinion that the above recommended repairs should be made quickly to prevent the pipe from collapsing. Temporary internal repairs are not possible unless the sewer is taken out of service. Since taking the pipe out of service involves a major bypass pumping effort, it would be cost effective to make permanent repairs in the entire 48-inch interceptor at that time.

If you have any questions about the proposed rehabilitation work, please call me.

Very truly yours,

CLINTON BOGERT ASSOCIATES

Wayne Eakins

WE/GPJ:pc

KLLC1023

846570077

PASSAIC VALLEY SEWERAGE COMMISSIONERS
600 WILSON AVENUE
NEWARK, N. J. 07105
(201) 344-1800

May 3, 1931

Clinton Bogert Associates
2125 Center Avenue
Fort Lee, New Jersey 07024

Re: 48" Interceptor Repair
(Raymond Boulevard)

ATTENTION: Mr. Wayne Eakins

Dear Mr. Eakins:

In response to your letter of April 13, 1981, the Commissioners at their meeting of May 7, 1931, authorized you by Resolution #15, copy attached, to proceed with the design of the necessary repairs to the 48" sewer in Raymond Boulevard.

This is your authorization to proceed with the necessary work immediately on the basis of a cost plus fixed fee contract, not to exceed $85,000., the terms of which are still to be negotiated. This authorization in advance of signing of formal contracts is required because of the emergent nature of the work which you have described in your letter of April 13, 1981.

You are further authorized to obtain, within the scope of your contract, the necessary subcontractors for required borings and surveying. It is understood that the cost for these subcontracts would be in addition to the upset price of $85,000. The cost of this work is estimated not to exceed $2,000.

Very truly yours,

PASSAIC VALLEY SEWERAGE COMMISSIONERS

CTP/ipg

CARMINE T. PERRAPATO,
Executive Director

Att.

KLLC10239

846570078

RESOLUTION

846570079

WHEREAS: Clinton Bogert Associates, Consulting Engineers, 2125 Center Ave., Fort Lee, N.J. have heretofore been engaged by the Commissioners as Consulting Engineers for the purpose of doing a preliminary engineering study for the reconstruction of the Brown Street Interceptor, and

WHEREAS: Clinton Bogert Associates in a letter dated April 13, 1981, has advised the Commissioners that as a result of their preliminary study to date, they have determined that the Brown Street Interceptor is in serious distress with the configuration of the Interceptor being elliptical and have further advised the Commissioners, that in their professional opinion, there is the probability of imminent collapse which would endanger the surface of Raymond Boulevard - Van Buren Street intersection, with resulting danger to the vehicular and pedestrian traffic as well as property, and

WHEREAS: the Consulting Engineers have recommended that immediate action be taken to do the design and construction plans and specifications so that the reconstruction contract can be awarded without delay, and

WHEREAS: the Chief Engineer in a letter dated May 4, 1981 has advised the Commissioners that based upon the report of Clinton Bogert Associates that immediate action should be taken to authorize Clinton Bogert Associates to proceed with the design, plans and specifications for the construction work and that in his opinion, the authorization to Bogert must be done on an emergency expedited basis, and

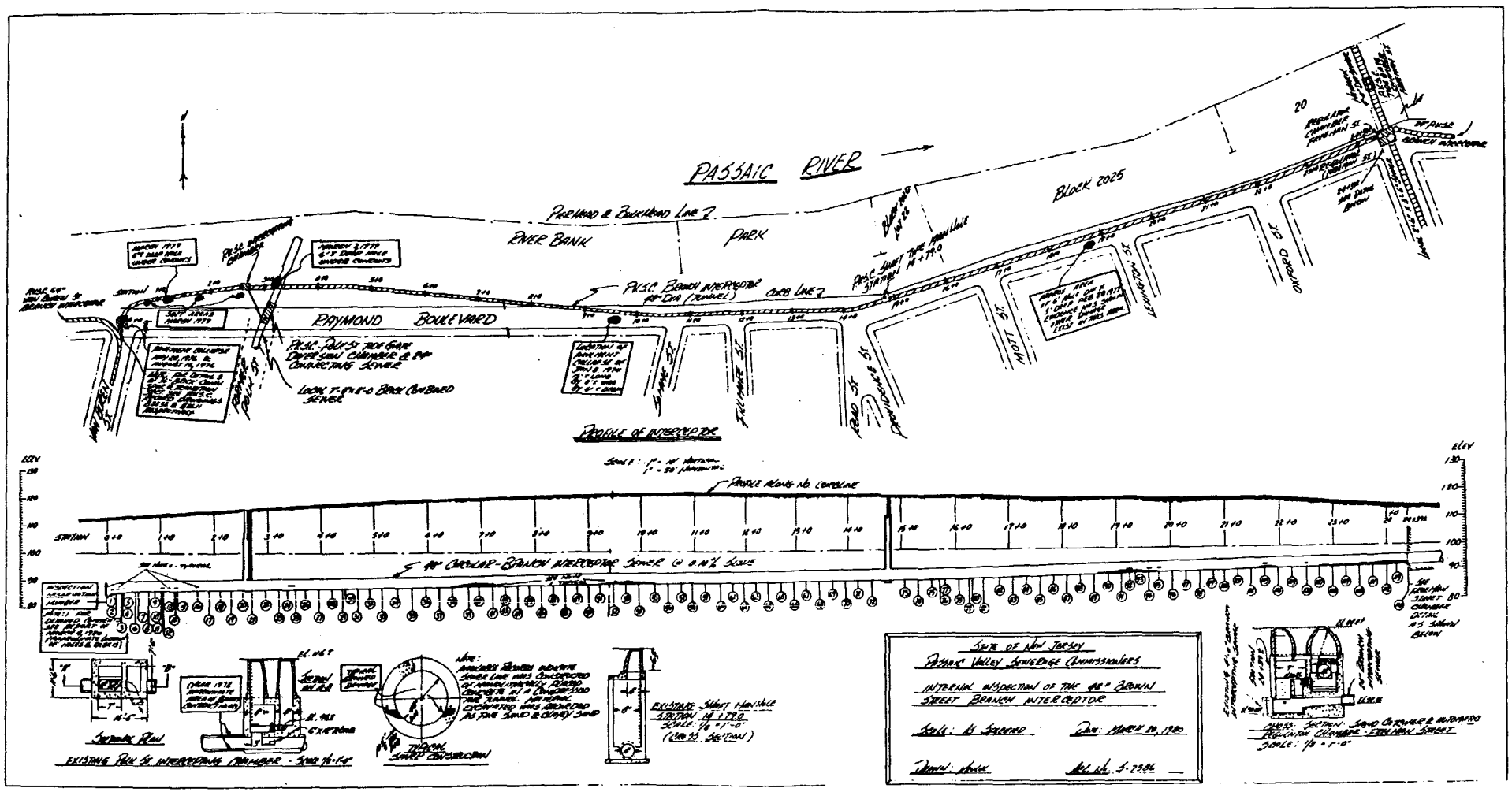
WHEREAS: the Commissioners have heretofore engaged the services of Clinton Bogert Associates for the preliminary study of the engineering work pursuant to an engineering selection process and the Commissioners determination that a continuity in the engineering work is required and Chief Counsel having advised the Commissioners that they have a right to rely upon the recommendations of the Consulting Engineer and the Chief Engineer,

continued on page 2

MEETING DATE _____

	YES	NO	EXCUSED	ABSTAIN	ABSENT	OTHER	REMARKS
Commr. Cifelli							
Commr. Corrado							
Commr. Davenport							
Commr. Giacomarro							
Commr. Keegan							
Commr. Lagos							
TOTAL							

KLC10240



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